Response to Comments on the Revision to the Arizona Regional Haze State Implementation Plan for the Salt River Project Coronado Generating Station; Significant Permit Revision No. 63088 to Operating Permit No. 52639 Issued to Salt River Project - Coronado Generating Station

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1. INTRODUCTION

The Arizona Department of Environmental Quality (ADEQ) proposed and finalized two actions through this process: a revision to the Arizona State Regional Haze State Implementation Plan (SIP) and Significant Permit Revision No. 63088 to Air Quality Control Permit No. 52639 for Salt River Project- Coronado Generating Station located 6 miles northeast of St. Johns off U.S. Highway 191 in St. Johns, Apache County, Arizona. The SIP and permit revision will become effective following the U.S. Environmental Protection Agency's (EPA) approval of the SIP and EPA's final action rescinding the current Federal Implementation Plan (FIP).

A public notice for this permit and SIP revision was published on July 21, 2016 and ended on August 23, 2016. On August 23, 2016, a public hearing was conducted at St. Johns High School Auditorium, 360 Redskin Drive, St. Johns, Arizona, to solicit comments. Written comments were received during the public comment period and written and oral comments were received at the public hearing. All comments received have been made part of the public record and have been reviewed by ADEQ.

2. BART ALTERNATIVE REVISIONS IN RESPONSE TO COMMENTS

In response to comments received during the comment period, SRP submitted an addendum to ADEQ, requesting ADEQ to revise certain aspects of the proposed SIP and permit revision. More specifically, the revisions described in that addendum address these changes to the proposed SIP and permit revision:

- A reduction in the maximum permitted SO_2 emission rate limit for each unit from 0.080 lb/MMBtu to 0.060 lb/MMBtu (on a 30-boiler-operating-day average) beginning December 5, 2017.
- Addition of an annual plant-wide SO_2 emissions cap of 1,970 tons per year (tpy), effective in each year beginning in 2018. If the Unit 1 Shutdown option is selected, there will be a Unit 2 cap of 1080 tpy beginning once Unit 1 is shutdown.
- Change of the BART Alternative Operating Strategy dates:
    - The deadline for SRP to submit notification of Operating Strategy selection is December 31, 2022, changed from the proposal's deadline of December 31, 2026.
    - The deadline for SRP to install and begin operating SCR on Unit 1 (if OS-1 is selected) or to close Unit 1 permanently (if OS-2 is selected) is December 31, 2025, changed from December 31, 2029.

Table 1 and Table 2 provide an overview of the revised BART Alternative operating strategies (OS-1 and OS-2) for CGS Unit 1. The changes to the BART Alternative dates will shorten the maximum length of the interim operating period from approximately twelve years to eight years. Moreover, due to a more stringent SO_2 emission limit of 0.060 lb/MMBtu for each of the two units, the originally proposed interim operating strategy IS1 – which included the currently permitted SO_2 emission limit of 0.080 lb/MMBtu for each unit – will be removed, while the interim operating strategies IS2, IS3, and IS4 will be retained, but with the SO_2 emission limit under IS2 lowered from the proposed limit of 0.070 lb/MMBtu to 0.060 lb/MMBtu. Finally, the annual plant-wide SO_2 emissions cap of 1,970 tons per year (tpy) that has now been added to all the interim strategies, and that will also apply indefinitely after the end of the interim period if SRP selects SCR as the final compliance strategy. If SRP selects the shutdown of Unit 1 as the

final compliance strategy, the annual emissions cap for Unit 2 will be 1,080 tpy. The lower emission limit and the annual emission caps as modified will further reduce SO_2 emissions to provide additional visibility improvement at the affected Class I areas as compared to the original proposal. ADEQ has incorporated these revisions into this responsiveness summary.

Table 1 Revised BART Alternative Operating Strategy SCR Option (OS-1)

Control Strategy		Original Proposal				Revised Proposal				
		Unit 1 (lb/MMBtu) (30-boiler-operating-day average)		Unit 2 SO_2 (lb/MMBtu) (30-boiler-operating-day average)	Unit 1 Curtailment Period	Unit 1 (lb/MMBtu) (30-boiler-operating-day average)		Unit 2 SO_2 (lb/MMBtu) (30-boiler-operating-day average)	Annual Plant-Wide SO_2 Cap (tons/year)	Unit 1 Curtailment Period
		NO_x	SO_2			NO_x	SO_2			
Interim Operating Strategy	IS1	0.320	0.080	0.080	Oct. 1-Apr. 15	N/A	N/A	N/A	N/A	N/A
	IS2	0.320	0.070	0.070	Oct. 21-Jan. 31	0.320	0.060	0.060	1,970	Oct. 21-Jan. 31
	IS3	0.320	0.050	0.050	Nov. 21-Jan. 20	0.320	0.050	0.050	1,970	Nov. 21-Jan. 20
	IS4	0.310	0.060	0.060	Nov. 21-Jan. 20	0.310	0.060	0.060	1,970	Nov. 21-Jan. 20
Final BART Alternative Strategy – SCR Installation	Emission Limit	0.065	0.080	0.080	N/A	0.065	0.060	0.060	1,970	N/A
	Timeline	Notification date: December 31, 2026 Install and operate SCR: December 31, 2029				Notification date: December 31, 2022 Install and operate SCR: December 31, 2025				

Table 2 Revised BART Alternative Operating Strategy Shutdown Option (OS-2)

Control Strategy		Original Proposal				Revised Proposal				
		Unit 1 (lb/MMBtu) (30-boiler-operating-day average)		Unit 2 SO_2 (lb/MMBtu) (30-boiler-operating-day average)	Unit 1 Curtailment Period	Unit 1 (lb/MMBtu) (30-boiler-operating-day average)		Unit 2 SO_2 (lb/MMBtu) (30-boiler-operating-day average)	Annual Plant-Wide SO_2 Cap (tons/year)	Unit 1 Curtailment Period
		NO_x	SO_2			NO_x	SO_2			
Interim Operating Strategy	IS1	0.320	0.080	0.080	Oct. 1-Apr. 15	N/A	N/A	N/A	N/A	N/A
	IS2	0.320	0.070	0.070	Oct. 21-Jan. 31	0.320	0.060	0.060	1,970	Oct. 21-Jan. 31
	IS3	0.320	0.050	0.050	Nov. 21-Jan. 20	0.320	0.050	0.050	1,970	Nov. 21-Jan. 20
	IS4	0.310	0.060	0.060	Nov. 21-Jan. 20	0.310	0.060	0.060	1,970	Nov. 21-Jan. 20
Final BART Alternative Strategy – Shutdown	Emission Limit	N/A	N/A	0.080	N/A	N/A	N/A	0.060	1,080	N/A
	Timeline	Notification date: December 31, 2026 Shutdown: December 31, 2029				Notification date: December 31, 2022 Shutdown: December 31, 2025				

3. COMMENTS AND RESPONSES

This summary presents the Department's responses to the issues raised by the comments received during the public comment period.

3.1 General Comments and Miscellaneous

Comment: *Many commenters urged ADEQ to approve the proposed SIP/permit revision because the proposed BART alternative would be the most practical immediate solution to provide visibility benefits and avoid a severe economic downturn. Because CGS plays a significant role in the local and regional economy by providing reliable electricity, job opportunities, and tax revenue, the future and destiny of CGS have a significant influence on towns, local communities, Apache County, Navajo County and the state of Arizona. The proposed BART alternative would allow CGS to continue to operate without sacrificing any of the legal obligations.*

Response: ADEQ acknowledges the comment.

Comment: *Some commenters supported the proposed SIP/permit revision because the revision helps the State of Arizona and SRP to manage the uncertainty created by EPA's Clean Power Plan, which is currently subject to a stay issued by the U.S. Supreme Court.*

Response: ADEQ acknowledges the comment.

Comment: *One commenter discussed implications of fire emissions management for regional haze regulations. The commenter stated that the regional haze regulations must better understand the role of fire in ecosystems, the connections between visibility-impairing pollutants and public heath, as well as the impacts of rule-making on industry. The commenter stated that past fire suppression practices have led to an increased risk of catastrophic wildfires (such as the Wallow Fire), which emit a much larger amount of air pollutants compared to emissions from power plants. The commenter stated that prescribed or managed wildfire is the most effective and efficient tool for restoring and maintaining the health of wildland while reducing the risk of adverse health and environmental impacts due to catastrophic wildfires.*

Response: While the commenter made pertinent points on fire management for regional haze mitigation purposes, the discussion of fire management is beyond the scope of the proposed SIP/permit revision. As discussed elsewhere, the proposed SIP/permit revision is source-specific, addressing how the BART alternative for CGS complies with the legal requirements under the regional haze rule.

Comment: *Some commenters expressed significant concerns about over-reaching federal regulations. Using the logging industry as an example, one commenter stated that federal regulations have resulted in the death, destruction and devastation of an entire industry. Another commenter stated that EPA attempted to eliminate all coal-fired power plants by imposing unrealistically low emission limits.*

Response: ADEQ understands that the shutdown of local industries would have significant negative impacts on the local community, but these comments do not directly relate to the SIP/permit action.

3.2 Comments on Permit Revision

Comment: *One commenter stated that the draft Significant Permit Revision (Attachment E) should be revised to provide the correct citation to ADEQ's legal authority to issue the Significant Permit Revision. The commenter pointed out that such authority is not based on the FIP promulgated by the EPA.*

Response: ADEQ agrees with the commenter. Necessary changes have been made in the citations in the draft permit revision.

Comment: *One commenter stated that the draft Significant Permit Revision is either deficient or unclear concerning some key emission limits and monitoring, reporting and recordkeeping (MRR) requirements. In particular, the commenter pointed out three significant issues: i) there are no specific MRR requirements to demonstrate compliance with the Unit 1 and Unit 2 emission limits in the interim operating scenarios; ii) the emission limits for NOx, PM_{10} and SO_2 for Unit 2 in the post-2029 operating scenarios are unclear, and the draft does not include MRR to demonstrate compliance with Unit 2 emission limits for the period after 2029; and iii) the PM_{10} emission limits for Units 1 and 2 for the interim operating scenarios are unclear, and the draft does not include MRR requirements for PM_{10} for Units 1 and 2.*

Response: The requirements mentioned in the comment were not listed in the permit revision since they are either referenced in other parts of the operating permit or, in the case of PM_{10} limits, were approved as part of the Partial Regional Haze SIP Approval on December 5, 2012 (77 FR 72511). However, ADEQ agrees that leaving these requirements out of Attachment E makes this permit revision more difficult to understand and would create uncertainties in the related SIP revision. Therefore, ADEQ has changed Attachment E into a self-contained document which includes all Regional Haze requirements applicable to the facility.

Comment: *One commenter stated that the draft Significant Permit Revision does not satisfy PSD permitting requirements. The commenter further stated, if CGS elects to install SCR on Unit 1 in 2029 or at any time, ADEQ must determine if PSD applies and, if so, must issue a PSD permit.*

Response: Once approved by EPA, this SIP revision allows SRP to install SCR at Unit 1. Although the deadline for this decision is December 31, 2022, SRP could make a final decision much earlier. The installation of an SCR would result in a potential increase of approximately 80 tons per year of $PM_{10/2.5}$ and sulfuric acid mist, which exceeds the PSD significant level for each of these pollutants and would require a PSD permit. Therefore, ADEQ and SRP conducted the necessary PSD analysis as required by Arizona Administrative Code Title 18, Chapter 2 Article 4, and ADEQ included PSD permit conditions as part of this significant revision. As documented in the Permit Technical Support Document, this analysis included a BACT analysis for PM_{10}, $PM_{2.5}$, and H_2SO_4, a SIL analysis for PM_{10} and $PM_{2.5}$, a NAAQS and increment analysis for $PM_{2.5}$, a growth impact analysis and an analysis of possible impairment to soils and vegetation.

3.3 Comments on Visibility Modeling

3.3.1 Transparency of Public Record

Comments: *One commenter stated that there were significant transparency and accessibility issues regarding the modeling underlying the BART proposal. The commenter stated that the public record was incomplete which prevented the commenter's consultant from fully and adequately reviewing the modeling for the proposal. The commenter also stated that ADEQ did not provide enough time for an adequate review of the modeling. The commenter requested the following public records for review: i) all modeling-related correspondence between SRP, its consultants and both the ADEQ and US EPA; ii) all model inputs and outputs for any CALPUFF modeling that has been conducted in order to support the IS1-IS4 options; and iii) specific information regarding who requested that CAMx be used for this BART alternative or better-than-BART analysis.*

Response: All modeling and related materials on which ADEQ has based its proposed SIP have been included in the record. The record supporting ADEQ's final SIP is complete and publicly available, and the public has been provided an adequate opportunity to review and comment on ADEQ's proposal. During the comment period, the commenter requested ADEQ to provide additional modeling information, and ADEQ responded to the commenter's request promptly. Regarding the CALPUFF/CAMx comments, please refer to Section 3.3.2. Regarding modeling-related correspondence between ADEQ and other parties, ADEQ will compile all email communications and transmit them to the commenter.

3.3.2 Model Selection (CALPUFF vs. CAMx)

Comments: *One commenter stated the EPA's proposed revisions to delist CALPUFF as the EPA-preferred long range transport model are not finalized yet. Therefore, the commenter requested using CALPUFF to do the entire analysis of the IS options and curtailment periods. The commenter further stated that the CALPUFF modeling must use multiple*

years of meteorological data and all modeling files must be available in the public record for review.

Response: ADEQ understands that EPA's proposed revisions to delist CALPUFF as the EPA-preferred long range transport (LRT) model have not been finalized yet. ADEQ agrees that CALPUFF modeling must use multiple years of meteorological data (typically three years). However, it is ADEQ's determination that it would be unnecessary and inappropriate to redo the entire modeling analysis for this SIP revision using CALPUFF. Neither the current version of 40 CFR Part 51 Appendix W (Guideline on Air Quality Model) nor 40 CFR Part 51 Appendix Y (Guidelines for BART Determinations under the Regional Haze Rule) requires the use of CALPUFF in the regional haze program:

- When EPA promulgated CALPUFF as a preferred model in 2003, EPA only approved it for long range transport for direct emissions, but EPA did not provide preferred status to CALPUFF for use of its chemistry module for generating values for secondary formed pollutants, including those that can impair visibility. EPA has specifically pointed out that the current version of Appendix W "*does not contain any explicit recommendation regarding the use of CALPUFF in the regional haze program*." 80 Fed. Reg. 45350 (July 29, 2015).

- In 2005, EPA issued guidelines for implementation of the best available retrofit technology (BART) requirements under the Regional Haze Rule. Although EPA recognized that CALPUFF had not yet been fully evaluated for secondary pollutant formation, EPA still recommended that states use CALPUFF in the BART determination process because CALPUFF was the best modeling application for use in evaluating BART at that time. However, EPA also made clear that states could use other approaches including photochemical grid models. The BART guidelines state that, "*States may consider their [Regional scale photochemical grid models] use for SIP development in the future as they are adapted and demonstrated to be appropriate for single source applications*." 70 FR 39104; 39123-39124 (July 6, 2005).

As the commenter is aware, in EPA's proposed revisions to its Guideline on Air Quality Models, EPA proposes to remove CALPUFF as the preferred model for long-range transport (involving source-receptor distances of 50 kilometers or longer) and visibility modeling and instead recommends use of photochemical grid models, like CAMx, for such purposes. 80 Fed. Reg. 45340, 45347, 45349 (July 29, 2015). EPA states that:

"*Photochemical transport models are suitable for estimating visibility and deposition since important physical and chemical processes related to the formation and transport of PM are realistically treated. Source sensitivity and apportionment techniques implemented in photochemical grid models have evolved sufficiently and provide the opportunity for estimating potential visibility and deposition impacts from one or a small group of emission sources using a full science photochemical grid model. Photochemical grid models using meteorology output from prognostic meteorological models have demonstrated skill in estimating source-receptor relationships in the near-field and over long distances.*"

Id. at 45349 (footnotes omitted). This policy is reflected in EPA's recent final regional haze rule for Texas and Oklahoma, where EPA used CAMx modeling to support its federal implementation plan for those states and where it stated that CAMx can produce more

reliable results than CALPUFF under a variety of conditions. 81 Fed. Reg. 296, 327-28 (Jan. 5, 2016). EPA's preference for photochemical grid models is also stated in its recent "Draft Guidance on Progress Tracking Metrics, Long-term Strategies, Reasonable Progress Goals and Other Requirements for Regional Haze State Implementation Plans for the Second Implementation Period" intended to inform implementation of the regional haze program during its second implementation period[1]. Accordingly, use of CAMx to evaluate the BART alternative for Coronado Generating Station is consistent with EPA's regional haze rules and EPA's current practices.

As discussed in the Technical Supporting Document for Regional Haze State Implementation Plan Revision for the Coronado Generating Station (TSD) Pgs.18-19, ADEQ has determined that the use of a photochemical grid model (PGM) rather than CALPUFF was appropriate for the CGS Better-than-BART (BTB) demonstration based on the following reasons:

- There are fundamental differences between BART assessments and the "Better than BART" demonstration for BART alternatives. BART assessments with CALPUFF are targeted towards assessing the maximum (or 98th percentile) impacts of a single facility's sources on Class I areas without considering any other emission sources. For this purpose, CALPUFF was recommended to be used for BART assessments as one of the five factors in the overall RH BART analysis. For a "Better than BART" demonstration, however, the language of 40 CFR 51.308(e) addresses "greater reasonable progress" that would be resulted from BART alternatives compared to BART. To demonstrate "greater reasonable progress," a PGM that includes modeling of all emissions in the modeling domain may be more appropriate in many circumstances than CALPUFF.

- CALPUFF has highly simplified chemical transformation algorithms that have been shown to have bias with respect to sulfate and nitrate formation. Given that the CGS BART Alternative modeling involves assessment of visibility benefits from reductions in SO_2 emissions and NOx emissions between the alternative strategies and the BART control strategy, accurate and unbiased treatment of sulfate and nitrate formation chemistry is needed. A PGM with full science chemistry algorithms for secondary $PM_{2.5}$ formation (e.g., sulfate and nitrate) can meet this requirement.

- Resources are available to utilize a photochemical grid model for the CGS BTB demonstration. A PGM is a tool that also requires additional time and resources to conduct a proper evaluation as compared to CALPUFF. CALPUFF may be the only tool available in many visibility modeling cases due to the large time and resource demands of photochemical modeling. For the CGS BTB demonstration, however, the databases that, in part, are necessary to perform the CAMx modeling analysis are available and adequate. The CAMx modeling for CGS extensively used a 2008 modeling database that was originally developed as part of the Western Regional Air Partnership (WRAP) West-wide Jump-Start Air Quality Modeling Study and then was adopted by the Western Air Quality Study. The 2008 modeling database is complete and comprehensive as it has been extensively reviewed by control agencies.

[1] https://www.epa.gov/sites/production/files/2016-07/documents/draft_regional_haze_guidance_july_2016.pdf (Pgs. 18,60-64)

- With advances in photochemical modeling science, a PGM can be used for a single-source application. For example, CAMx includes a subgrid-scale Plume-in-Grid (PiG) chemically reactive Gaussian puff model to treat the near-source plume dispersion, dynamics and chemistry within point-source plume, which is critical for CGS modeling. It also includes a mature, fully tested and evaluated Particulate Source Apportionment Technology (PSAT) tool for separately tracking the particulate matter impacts associated with emissions from CGS.

In summary, neither the regional haze regulations nor Appendix W requires the use of CALPUFF for regional haze modeling. In particular, there are no existing regulations or guidance which requires the use of CALPUFF to evaluate the "greater reasonable progress" that would result from the BART alternative as compared to BART. As discussed above, a PGM such as CAMx is more appropriate than CALPUFF for the CGS "greater reasonable progress" analysis because a PGM has full science chemistry algorithms for sulfate and nitrate formation, and a PGM is able to simultaneously model changes in emissions not only from CGS but also from other sources in the airshed. The availability of a robust database as well as tools such as PiG and PSAT further ensures a proper evaluation with CAMx. ADEQ is also aware that EPA and other states such as Texas have used CAMx for BART analysis under regional haze rules. For these reasons, ADEQ determined that it is not necessary to conduct CALPUFF modeling for the CGS BTB demonstration.

Comment: *One commenter requested all model inputs and outputs for any CALPUFF modeling that has been conducted in order to support the IS1-IS4 options. The commenter also requested specific information regarding who requested that CAMx be used for this BART alternative or better-than-BART analysis.*

Response: The determination to use CAMx resulted from a joint effort by SRP and EPA to address a unique modeling situation associated with the CGS BTB demonstration. ADEQ's decision on the CGS BTB demonstration was exclusively based on the CAMx modeling submittals from SRP to ADEQ. ADEQ does not have any CALPUFF-related modeling files in its possession.

On July 21, 2015, SRP submitted a CAMx modeling protocol to EPA Region 9 and ADEQ for review. EPA Region 9 worked with other EPA experts to provide comments to SRP. Several conference calls were held among SRP, SRP's consultants, EPA Region 9 and ADEQ to discuss CAMx modeling issues. The final SRP CAMx modeling analysis has addressed all comments from EPA. SRP also updated CAMx modeling files based on ADEQ's review and comments.

The idea to use CAMx came through collaborative discussions among the parties involved. The relevant questions are whether the use of CAMx instead of CALPUFF was appropriate and whether the CAMx modeling was conducted properly. In response to previous comments, ADEQ documented why the use of CAMx was appropriate. Moreover, ADEQ determined that the CAMx modeling was conducted properly because it followed a protocol to define the procedures to be followed, the data to be collected, and the BTB demonstration to be presented.

Comments: *One commenter urged SRP to provide comparable and parallel CALPUFF and CAMx results given that the output metrics from CAMx and CALPUFF are vastly different. The commenter also stated that the comparison of the model results from CALPUFF and CAMx should consider the entire distribution of differences (annual average, W20 and B20) as well as the impacts on days when the peak impacts occur.*

Response: In the TSD Pgs.31-32, ADEQ discussed fundamental differences with respect to modeling visibility impacts between CAMx and CALPUFF, differences that make CAMx and CALPUFF results not directly comparable. First, under a typical BART analysis with CALPUFF, ammonia and other precursors are more fully available to react with the facility's emissions and generate haze-causing pollutants. Comparatively, CAMx is a full photochemical model with all the other sources quantified and added to the modeling, such that emissions from other sources react with available precursors such as ammonia. This limits the amount of ammonia (and other precursors) that is available to react with CGS emissions. Second, a typical BART analysis with CALPUFF is focused on the highest impact (maximum or 98th percentile) from a facility regardless of the monitored values at the Class I area, whereas the CAMx analysis is focused on the 20% best and 20% worst monitored days regardless if the facility was having an impact during those days. Finally, CALPUFF uses a rather simple chemistry mechanism while CAMx uses a technically sophisticated chemistry mechanism. It is unclear how this ultimately impacts the model estimates between these two models as the two chemistry approaches are vastly different.

While the commenter is interested in comparable and parallel modeling results from CALPUFF and CAMx, the commenter did not provide recommendations on how to perform a comparable and parallel modeling analysis for CALPUFF and CAMx. Due to fundamental differences regarding modeling visibility impacts between the two models, ADEQ has determined it would be impossible to directly compare the model results from the two models, and any attempt at a comparison would not be meaningful.

The commenter also suggested testing a variety of output metrics. It should be noted that the output metrics are not driven by the model that is selected, but by the regulatory test that is being conducted. A BTB demonstration must demonstrate that a BART alternative will achieve greater reasonable progress toward natural visibility conditions than BART under 40 CFR 51.308(e)(3) or otherwise based on the clear weight of evidence.[2] While the "clear weight of evidence" test may examine a number of different metrics from modeling results (typically based on CALPUFF modeling), ADEQ evaluates the BTB demonstration for CGS under 40 CFR 51.308(e)(3), which specifically provides that the BTB regulatory test may be based on the two-prong test for the "Best 20%" and "Worst 20%" days (similar to the metrics used in a Regional Haze progress assessment). Consideration of annual average, 98th percentile values, peak impact, or "the entire distribution of differences" is not required under 40 CFR 51.308(e)(3).

[2] 40 CFR 51.308(e)(2)(i)(E).

3.3.3 Meteorological Data

Comments: *Two commenters expressed concerns about the use of one year of meteorological data (2008) for CAMx. One commenter stated that the CAMx modeling SRP conducted was flawed because it was based on just one year of meteorological data, which effectively ignores the annual variability in meteorological and other conditions. The commenter also stated that the "complexities" with PGM modeling should not be used as an excuse for using only one year of meteorological data. Given the variability of regional transport and meteorological conditions from year to year as well as very small changes in visibility predictions between different model scenarios, another commenter requested SRP to work with ADEQ and EPA to evaluate multi-year impacts of the Alternative BART curtailment periods in order to ensure greater overall visibility improvement under any interim operations of CGS compared to EPA's FIP. To address interannual variability, the commenter recommended either using the 2011 meteorological database from the Intermountain West Data Warehouse (IWDW) or using a weight of evidence approach.*

Response: (1) One-year vs. Multiple-years of Meteorological Data

EPA's general modeling guidance is to utilize multiple years of data for dispersion models (for example, the use of 5 years of NWS meteorological data for AERMOD and the use of 3 years of prognostic meteorological data for CALPUFF). However, neither Appendix W nor the BART Guidelines specify the meteorological period that is necessary if a PGM is used. Because PGMs are very complicated modeling analyses and very resource intensive, EPA has issued specific modeling guidance documents for PGM analyses to clarify and provide additional guidance on when and how to use the models. EPA's modeling guidance for PGMs stresses the need to pick representative periods to model that may be only one year or less of meteorology but are representative of the baseline period (in this case, 2008). The 2014 Draft Modeling guidance indicates that one full year should be modeled for Regional Haze[3]:

*"**Regional Haze -** Choose time periods which reflect the variety of meteorological conditions which represent visibility impairment on the 20% best and 20% worst days in the Class I areas being modeled (high and low concentrations necessary). This is best accomplished by modeling a full year."*

SRP's use of one year of meteorological data for CAMx modeling adhered to the above guidance. Moreover, the use of one year of meteorological data is the standard and customary practice when conducting PGM analyses for ozone or $PM_{2.5}$ SIPs, EISs, and regional haze BART or progress determinations. All of the regional haze SIPs for the first implementation period (2004-2018) that were originally due in 2007 used one meteorological year (2002) of PGM modeling for the demonstration of reasonable progress. ADEQ is not aware of any regional haze modeling with a PGM which used

[3] Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze (2014) https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf (Pg. 17)

multiple years of meteorological data. In another comment that will be discussed later, the commenter cited the regional haze application of CAMx for the state of Texas. The Texas Commission on Environmental Quality (TCEQ) regional haze modeling using CAMx only used one base year of meteorological modeling. EPA's BART visibility modeling for the Texas regional haze FIP published in the Federal Register in 2016 used CAMx using one base meteorological year (2002) for the modeling. And most recently (September 7, 2016) for EPA's Cross-State Air Pollution (Transport) Rule, EPA performed PGM using one base meteorological year of modeling.

In summary, although the use of multiple years of meteorological data is always welcomed for a modeling analysis, ADEQ must consider a balance between modeling a long period and the available resources and reasonableness in the amount of computation time and other resources needed for a PGM-based analysis. Considering the complexity of meteorological data processing and validation, the 2014 Draft modeling guidance for regional haze, as well as the past regional haze modeling practices with a PGM, ADEQ determined that the use of one year of meteorological data satisfied the regulatory requirements for a BART BTB demonstration.

(2) 2008 vs. 2011 Meteorological Database

ADEQ appreciates one commenter's recommendation about the use of the 2011 meteorological database from IWDW. ADEQ was aware that IWDW released the 2011 air quality model platform in July 2016. ADEQ determined that the use of the 2011 database would be beyond the scope of a standard PGM application for regional haze modeling. Moreover, ADEQ has determined that the 2008 base meteorological year would be a better year for the CGS BART modeling than 2011, as discussed below.

EPA's PGM modeling guidance recommends that the base meteorological year not have atypical meteorological conditions, such as unusually low temperatures that would inhibit secondary PM formation processes or excessive precipitation that would wash out pollutants. Figures 1 and 2 below compare the CGS BTB 2008 base meteorological year temperature and precipitation data against a long-term (> 100-year) record to determine whether 2008 represents atypical meteorological conditions. Also included in Figures 1 and 2 is the comparison with 2011 meteorological year temperature and precipitation data that the commenter suggested. The 2008 temperatures in AZ and NM are slightly above normal but not atypical, and the 2008 precipitation amounts in AZ and NM are near normal and are not atypical. Thus, the 2008 meteorological conditions around the location of CGS are not atypical. In contrast, the 2011 meteorological year had record-setting high temperatures and drought in the Gulf States (e.g., Texas) that spilled into New Mexico, including Class I areas where CGS BTB visibility impacts are evaluated. Thus, based on this analysis, the 2008 base meteorological year would be a better year for the CGS BART modeling than 2011.

ADEQ also has some concerns about the representativeness of the 2011 monitoring data for some IMPROVE sites, due to the Wallow Fire (May 29, 2011 - July 8, 2011), the biggest wildfire recorded in Arizona. The Wallow Fire resulted in the temporary shutdown of the Mount Baldy site, and the 20% best and 20% worst days at this site for 2011 could not be determined. The Wallow Fire also had a significant impact on the visibility

conditions for some New Mexico sites such as Bandelier and San Pedro Parks (Figure 3), likely resulting in a biased determination for the 20% worst days for these sites. As the BTB modeling demonstration requires evaluation of an overall visibility impact over all affected Class I areas, the use of the 2011 atypical visibility conditions at some IMPROVE sites would prevent ADEQ from fully and adequately reviewing the BART Alternative.

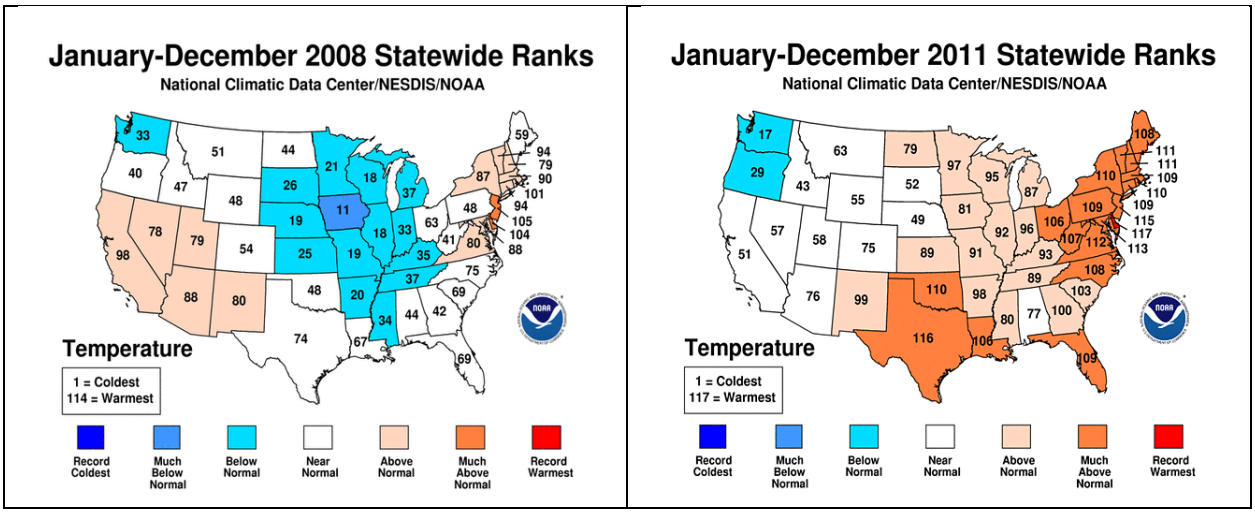


Figure 1 Ranking of Temperature Conditions in 2008 (left) and 2011 (right) over a 100 Year Record (Source: http://www.ncdc.noaa.gov/temp-and-precip/us-maps/)

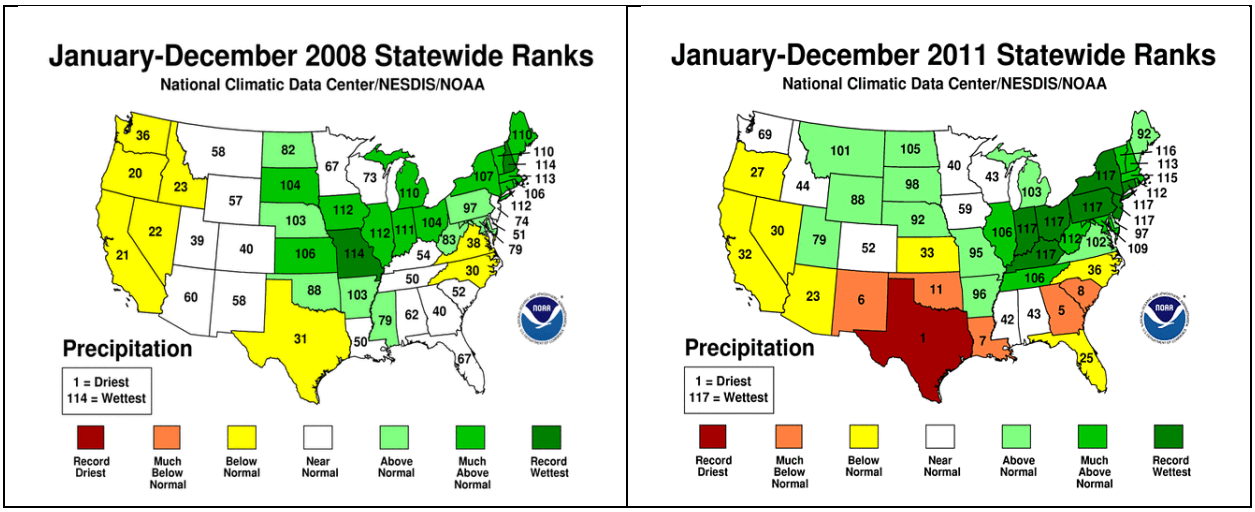
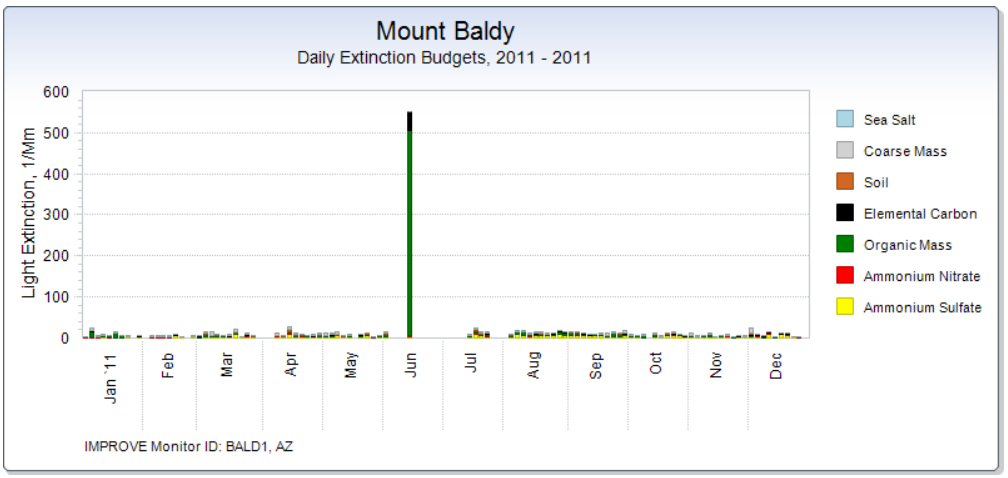
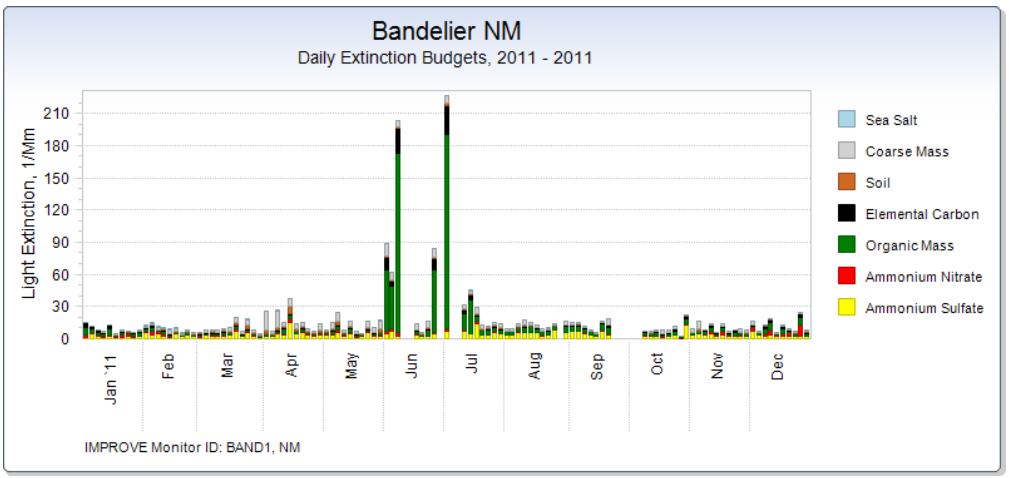


Figure 2 Ranking of Precipitation Conditions in 2008 (left) and 2011 (right) over a 100 Year Record (Source: http://www.ncdc.noaa.gov/temp-and-precip/us-maps/)





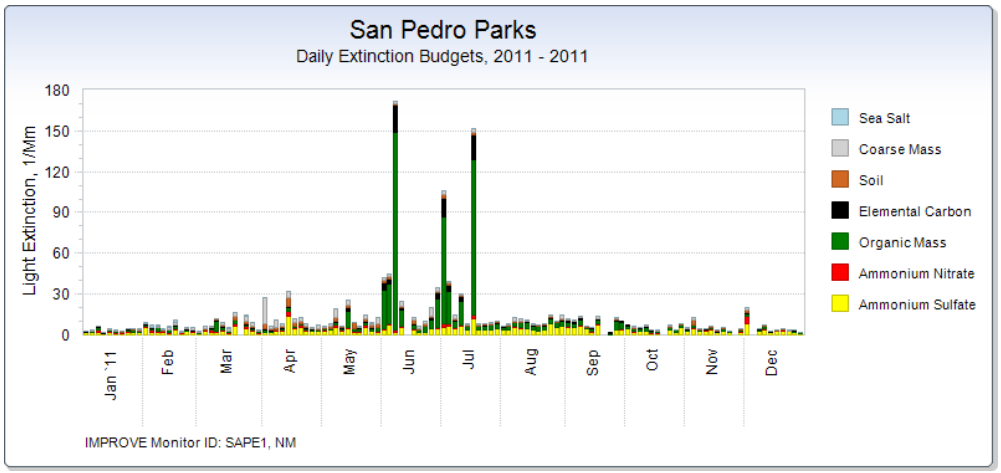


Figure 3 Daily Extinction for Three IMPROVE Sites (Mount Baldy, Bandelier NM, and San Pedro Parks) in 2011 (Source: http://vista.cira.colostate.edu/Improve/data-page/)

3.3.4 Emissions

Comment: *One commenter stated that daily heat input rates used for annual emission estimation were inconsistent with those used for developing monthly and hourly emission scalars that reflect the typical seasonal and diurnal variations. Furthermore, the commenter stated that the modeling documentation did not provide justification for why the heat inputs for future years will be similar to historical heat inputs.*

Response: There are two emission calculations that are performed that require actual heat input data. The first is an annual actual emission analysis to address the emission reduction requirements under 40 CFR § 51.308 as well as the demonstration of noninterference with NAAQS under Section 110(l) of the CAA. These annual emission calculations utilized three recent years of heat input data (2008-2010). The second use of daily heat input data was for refining the CAMx modeling to reflect typical diurnal and seasonal variations in hourly emission rates. For this latter analysis, five years of data centered on the 2008 baseline modeling year were used to compile diurnal and seasonal hourly variations. Given that the basis for both the annual calculations and the hourly variation calculations is the same Clean Air Markets Division (CAMD) data base, there is no inconsistency in the emission calculations; there simply are two types of emission calculations that were performed.

The use of the baseline heat input value for estimating future emission is consistent with the RHR and BART Guidelines. ADEQ determined that the use of five years of heat input data centered on the 2008 baseline modeling year was appropriate and robust for estimating future emissions for CGS.

Comment: *One commenter stated that the modeling documentation did not provide justification for why the biogenic, fire, and windblown dust emissions for future years will remain unchanged from the 2008 base case emissions scenario. Since the modeling did not conduct a sensitivity analysis to demonstrate the robustness of this assumption, the commenter concluded that the model results were unreliable.*

Response: With the exception of climate change modeling looking far into the future (e.g., 2050-2100), it is standard practice in PGM modeling to hold biogenic, fire and windblown dust (WBD) emissions constant at the base meteorological year level (2008 in this case) when doing future year emission scenario modeling. EPA does not recommend that air agencies explicitly account for long-term climate change in the SIP demonstration because climate projections are more robust for periods at least several decades in the future while the timespan between base and future year meteorology is relatively short in most SIP demonstrations (less than 20 years).[4]

[4] https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf (Pgs. 28-29)

Biogenic and WBD emissions depend on meteorological conditions (e.g., temperature, sunlight and wind speed) and land use characteristics (Leaf Area Index, Plant Functional Type, soil characteristics, surface roughness lengths). Without any basis for adjusting these parameters, the only defensible and justifiable assumption is that biogenic and WBD emissions would be the same in the base and future year modeling. For fires, it is impossible to predict what fires will be like in a future year; therefore, the most justifiable assumption is that fire emissions in the future year will be the same as in the base meteorological year.

3.3.5 Better-than-BART Demonstration

Comment: *One commenter stated that, while SRP'S CAMx model report provides spatial plots to compare visibility benefits between model scenarios, these plots were based on annual averages, which would smooth over numerical artifacts that are of concern in the "noise" issue. The commenter recommended adding plots to show nitrate/sulfate differences between model scenarios for the subset of days of concern, which would be more useful to demonstrate the actual visibility benefits from "Better-than-BART" scenarios 1-4.*

Response: Based on the comments, SRP performed additional data analyses to investigate whether the CAMx results for the CGS Better-than-BART (BTB) scenarios are influenced by numerical "noise" which may be smoothed out by averaging the results over multiple days. The analyses indicate that the CAMx modeling results for the BTB test are valid numerical results. Although the differences between the scenarios (i.e., "Prong 1" and "Prong 2" on individual days) are small, they are not artifacts of numerical "noise" but represent valid modeled responses to different CGS emissions scenarios. Please refer to Appendix A for detailed discussions.

Comment: *Given large allowable bias and errors in model performance, one commenter questioned the likely errors in the start and end dates for each of the proposed IS curtailment periods and challenged the reliability of the curtailment periods.*

Response: The comment implies there is a relationship between the start/end dates of the CGS curtailment periods in the BTB scenarios and the CAMx model performance, but the comment presents no evidence that this is the case. The CAMx 2008 model performance is within the range deemed acceptable in EPA's PGM modeling guidance (EPA, 1991[5]; 2007[6]; 2014[7]), the PGM peer-reviewed scientific literature (e.g., Boylan and Russell, 2006[8]; Simon, Baker and Philips, 2012[9]) and past PGM applications for ozone, PM and regional haze SIPs and visibility BART PGM modeling. Moreover, the CAMx modeling

[5] https://www3.epa.gov/ttn/scram/guidance/guide/uamreg.pdf
[6] https://www3.epa.gov/ttn/scram/guidance/guide/final-03-pm-rh-guidance.pdf
[7] https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf
[8] http://capita.wustl.edu/capita/capitareports/071124_dataassimilation/cmaq_eval/jboylan_cmaq_pmeval.pdf
[9] http://www.sciencedirect.com/science/article/pii/S135223101200684X

for CGS was used to compare different scenarios in a relative sense. Any overall bias would be likely to cancel out when comparing one CGS emission scenario run to another.

Comment: *One commenter urged EPA and ADEQ to examine the hourly evolutions (animated spatial plots of SO4 and NO3) in order to confirm that the contributions (and differences) are actually from the CGS source(s).*

Response: The suggested analysis would be subjective and inconclusive. A more rigorous and quantitative method of determining CGS impacts was used, the CAMx Particulate Source Apportionment Tool (PSAT). PSAT uses reactive tracers (also called tagged species) that run in parallel to the CGS emissions to determine the visibility contributions from CGS.

Comment: *One commenter stated that the modeling documentation did not discuss numerical errors and uncertainties and their effects on the results. As stated, the modeled noise from PGM modeling can appear to make one strategy slightly better than another on some modeled days when the source does not even impact the Class I area.*

Response: As noted earlier, please refer to Appendix A for detailed discussions about the "noise" and uncertainties issues.

Comment: *Citing the visibility application of CAMx in Texas, the commenter stated that the CAMx modeling must use a "clean background".*

Response: The commenter suggests that the CGS CAMx modeling did not use a "clean background". However, the CGS CAMx visibility results were calculated using annual average natural background conditions, following EPA's recommended approach to determine "clean" natural background visibility values. Natural conditions could be determined based on annual average natural conditions or the average of the best days for natural conditions. While use of the 20% best days of natural conditions would result in higher calculated deciview impacts, EPA determined that the use of the annual average natural background value was more appropriate.[10] Moreover, the CGS CAMx visibility results were used to compare different control scenarios in a relative sense (absolute values are less important). It is very unlikely that the use of different methods to calculate the "clean background" would affect the BTB demonstration for CGS.

Comment: *One commenter stated that the BART Alternative failed to meet the regulatory requirement of "greater reasonable progress" because the model results indicated that the visibility would get worse at Mt. Baldy under the alternative as compared to the BART control.*

Response: As discussed in the TSD, the modeling has demonstrated greater reasonable progress because both of the following two criteria were met:

[10] https://www.epa.gov/sites/production/files/2015-12/documents/tx-ok_sip-fip_response_to_comments_508_compliant.pdf (Pgs. 645-646)

- Prong 1: Visibility does not decline in any Class I area, and
- Prong 2: There is an overall improvement in visibility, determined by comparing the average differences between BART and the alternative over all affected Class I areas.

The BART Alternative satisfies Prong 1 of the Better-than-BART test because the alternative control strategy would result in improved visibility at all affected Class I areas (including Mt. Baldy Wilderness Area) compared to baseline conditions.

For Prong 2 of the Better-than-BART test, the alternative control strategy must achieve an overall improvement in visibility averaged across all affected Class I areas compared to visibility in those area under the BART control strategy. ADEQ agrees that modeling indicates that visibility at Mt. Baldy Wilderness Area will not improve as much under the BART Alternative as compared to BART. However, this does not preclude approval of the BART Alternative because, as explained in the proposal, the BART Alternative would result in improved visibility at all affected Class I areas compared to baseline conditions and would result in improved visibility, on average, across all Class I Areas, compared to BART. As EPA explained in the preamble to the final BART Alternative Rule:

"*. . . within a regional haze context, not every measure taken is required to achieve a visibility improvement at every class I area. BART is one component of long term strategies to make reasonable progress, but it is not the only component. The requirement that the alternative achieves greater progress based on the average improvement at all Class I areas assures that, by definition, the alternative will achieve greater progress overall. Though there may be cases where BART could produce greater improvement at one or more class I areas, the no-degradation prong assures that the alternative will not result in worsened conditions anywhere than would otherwise exist. . .*"[11]

In promulgating the BART Alternative requirements, EPA clearly contemplated that there could be instances where a BART alternative would result in less reasonable progress than BART at a particular Class I area, yet ensure overall greater reasonable progress than BART. This is the case with the BART Alternative for CGS.

Comment: *One commenter expressed his opposition to the ADEQ's entire proposal because the NOx emission reductions under any of the four IS options would be far lower than the current FIP NOx limit.*

Response: ADEQ agrees that the NOx emission reductions under any of the IS options in the proposed BART alternative would be less than the NOx emission reductions under the current BART FIP. However, the BART Alternative would result in decreases in emissions of SO_2 and PM_{10}. In this situation, where both BART and the BART Alternative would result in reduced emissions of one pollutant (or, in the case of the BART alternative, reduced emissions of two pollutants) but increased emissions of another pollutant, ADEQ determined it would not use the "greater emissions reductions" test under 40 CFR 51.308(e)(3). Instead, ADEQ chose to evaluate dispersion modeling to determine if the alternative achieves greater reasonable progress than BART under 40 CFR 51.308(e)(3).

[11] 71 FR 60612, 60621-22.

As discussed in the TSD, the modeling has demonstrated greater reasonable progress because both of the following two criteria were met:

- Visibility does not decline in any Class I area, and
- There is an overall improvement in visibility, determined by comparing the average differences between BART and the alternative over all affected Class I areas.

Moreover, as explained in the SIP TSD, Section 110(l) of the CAA does not require a BART alternative to be more stringent for emission controls for each criteria pollutant in every instance, and at every point in time, to supersede a prior BART determination. Rather, Section 110(l) provides that EPA may not approve a SIP revision if the SIP revision would interfere with any applicable requirement concerning attainment of NAAQS or any other applicable requirement of the Act. Apache County does not rely on the EPA FIP or BART Reconsideration for CGS to ensure continued attainment of the NAAQS. Neither the EPA FIP nor the BART Reconsideration represents existing control measures that have been put in place for attainment or maintenance of the NAAQS. Nor are these control measures in an RFP plan that provides for meeting the reasonable further progress milestones for a nonattainment area.

Based on the considerations described above, ADEQ has determined that the BART alternative meets all requirements of the CAA and the RHR and thus should be approved.

3.4 Comments on RHR and CAA Compliance

3.4.1 Compliance Deadlines

Comment: *One commenter expressed concerns about the timing of implementing and sustaining visibility protection through an alternative. The commenter was concerned with the timing of the notification deadline (December 31, 2026) and the final compliance controls deadline (December 31, 2029), as having a long period of interim emissions curtailment may create legal uncertainties. The commenter stated that the timing of the notification step and the final installation of SCR or shutdown should be coordinated with the implementation of the RHR's second planning period. In particular, the commenter recommended that the notification date should be no later than the mid-term reporting for the second planning period of the RHR, and that any final compliance controls should be placed no later than the end of the second reasonable progress planning period of the RHR.*

Response: ADEQ appreciates the comments. As presented in Section 2, the final compliance controls at Unit 1 (installation and operation of SCR at Unit 1 or the shutdown of Unit 1) will be implemented no later than December 31, 2025, three years earlier than the end date of the second planning period of the RHR. SRP also will notify ADEQ and EPA of its final compliance decision no later than December 31, 2022, one year earlier than the mid-term reporting for the second planning period of the RHR.

Comment: *One commenter stated that the proposed BART alternative for Coronado Unit 1 should be rejected because it would violate the five-year BART compliance deadline imposed by the Clean Air Act. In particular, the commenter pointed out that a source must install BART controls "as expeditiously as practicable", and under no circumstances can the compliance deadline be extended beyond five years after a BART determination is in place. However, the commenter stated, the proposed BART alternative would allow Unit 1 to continue polluting for more than twelve years beyond the compliance deadline.*

Response: ADEQ disagrees with these comments. The SIP revision does not delay the installation of BART controls but implements a BART alternative in accordance with 40 CFR 51.308(e)(2) and (3). The BART alternative includes interim compliance requirements and final compliance requirements. First, as documented in the TSD, the initial proposal satisfies the requirements of § 51.308(e)(3) passing the "better-than-BART" test. Second, and moreover, the lower SO_2 emission rate in the revised proposal will provide an even greater reduction in visibility impairment. Therefore, under both the interim and the final control strategies, the BART alternative would achieve greater reasonable progress toward natural visibility conditions than would be achieved through the installation, operation, and maintenance of BART as provided in the EPA FIP and the BART Reconsideration.

As explained in the RHR, ADEQ must demonstrate that all necessary emission reductions will take place during the first long-term strategy period. Sources subject to BART must be in compliance with the BART emission limitations as expeditiously as practical but no later than 5 years after EPA approves the implementation plan revision. The BART alternative will take effect on the same compliance date established by EPA's BART FIP, December 5, 2017. Therefore, the emission reductions from the BART alternative will occur during the first long-term planning period under Arizona's regional haze requirements, consistent with EPA's approach. In asserting incorrectly that the BART alternative would allow Unit 1 to continue polluting for more than twelve years beyond the compliance deadline, the commenter ignored the emissions reductions that will be achieved during the interim period, beginning on December 5, 2017.

In summary, the SIP revision constitutes a better-than-BART alternative that will take effect no later than 5 years after EPA published the BART FIP for CGS Unit 1 and will result in the necessary emission reductions occurring within the first long-term-strategy period for regional haze. The BART alternative satisfies the requirement that it achieve greater reasonable progress than BART and will achieve the necessary emission reductions on a schedule that is consistent with the five-year BART compliance deadline under the RHR.

Comment: *One commenter stated that the twelve-year delay that the commenter asserted would occur before Coronado Unit 1 would comply with its BART obligations would undermine the reasonable progress goals (RPGs) for the many national parks and wilderness areas impacted by Coronado's air pollution. If ADEQ grants SRP's request to delay Coronado's compliance obligations, the commenter stated, the RPGs must be reassessed and other sources must promptly reduce their pollution in order to ensure reasonable progress and compliance with the RPGs.*

Response: ADEQ disagrees with the comment. There is no twelve-year delay. As part of the BART alternative, the interim control strategies will take effect no later than 5 years after EPA published the BART FIP for CGS Unit 1. As explained in the TSD, during the interim period, the BART Alternative will result in improved visibility at all affected Class I areas compared with baseline conditions and will result in improved visibility, on average, across all Class I areas, compared with BART. First, as documented in the TSD, the initial proposal satisfies the requirements of § 51.308(e)(3) passing the "better-than-BART" test. Second, and moreover, the lower SO_2 emission rate in the revised proposal will provide an even greater reduction in visibility impairment. Therefore, in both the interim stage and the final stage, the BART alternative will achieve greater reasonable progress toward natural visibility conditions than would be achieved through the installation, operation, and maintenance of BART. ADEQ does not find any basis to conclude that the implementation of the BART alternative would undermine the RPGs for Class I areas impacted by CGS. ADEQ also does not find any reason to reassess the RPGs by incorporating any additional emission reductions from other sources.

Comment: *One commenter stated that the emission reductions from interim strategy options IS1-IS4 would apply for 2018-2029 and would not take place prior to 2018, failing to meet the RHR's requirement that all necessary emission reductions must take place during the first long term strategy period (i.e., by 2018).*

Response: ADEQ disagrees with the comment. The interim strategy options IS2-IS4 will take effect on the same compliance date established by EPA's BART FIP, December 5, 2017. For the first long-term strategy period, the end date is December 31, 2018. Therefore, the emission reductions from interim strategy options IS2-IS4 would take place during the period of the first long-term strategy for regional haze (i.e., by December 31, 2018).

Comment: *One commenter stated that the Clean Air Act does not provide the operational flexibility SRP would prefer (delay deciding whether to install SCR or shut down Coronado Unit 1). The commenter urged ADEQ not to finalize the proposed BART alternative and leave the existing BART determination in place.*

Response: ADEQ agrees that the CAA does not allow a delay, beyond the statutory and regulatory deadline for BART, to install BART controls. However, the CAA or RHR does allow flexibility to use a BART alternative instead of BART. As previously discussed, the BART Alternative for CGS would result in improved visibility at all affected Class I areas compared with baseline conditions and would result in improved visibility, on average, across all Class I areas, compared with BART. Moreover, as part of the BART alternative, the interim control strategies will take effect on the same compliance date established by EPA's BART FIP, December 5, 2017.

3.4.2 Anti-Backsliding Provision

Comment: *One commenter stated that the proposed BART alternative for Coronado Unit 1 should be rejected because it would violate the Clean Air Act's anti-backsliding provision. The commenter stated that the proposed BART alternative would result in greater air pollution and worse visibility impairment at Class I areas for 12 years after the BART compliance deadline. The commenter asserted that the existing BART determination is an "applicable requirement" under Clean Air Act Section 110(l), and that any revisions resulting in greater air pollution and worse visibility impairment are contrary to the Clean Air Act's anti-backsliding provision.*

Response: ADEQ disagrees with the comments. During the interim period, the BART Alternative would result in higher emissions of NOx. As explained in the TSD, however, Section 110(l) of the CAA does not require a BART alternative to be more stringent with respect to emission controls for each criteria pollutant in every instance, and at every point in time, to supersede a prior BART determination. In response to comments that New Mexico's 2013 RH SIP revision failed to outperform the existing BART determination for San Juan Generating Station, EPA stated that "Section 110(l) of the CAA does not prohibit a state from submitting a SIP revision that is less stringent than a FIP." Final BART SIP Approval Rule, 79 Fed. Reg. 60,985 60,989 (Oct. 9, 2014). In EPA's review of a proposed BART FIP-replacement SIP revision submitted by Oklahoma, EPA similarly stated that "[s]uch a SIP revision need not adopt the same suite of control options and techniques as EPA's FIP, nor does it necessarily have to be as stringent as EPA's FIP in all instances." 78 Fed. Reg. 51,686, 51,691 (Aug. 21, 2013). More recently, despite the fact that the BART alternative would result in higher NOx emissions than EPA's FIP, EPA approved a source-specific revision to the Arizona SIP that established a BART alternative at Arizona Electric Power Cooperative's (AEPCO) Apache Generating Station. 80 Fed. Reg. 19220 (April 10, 2015).

Section 110(l) of the CAA provides that EPA may not approve a SIP revision if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress (RFP), or any other applicable requirements of the CAA. As discussed in the SIP TSD, Apache County does not rely on the EPA FIP or BART Reconsideration for CGS to continue to attain any NAAQS. The EPA FIP and BART Reconsideration do not represent existing control measures that have been established for attainment or maintenance of NAAQS or for meeting any reasonable further progress milestones for any nonattainment area.

To the extent that requirements of EPA's regional haze regulations are considered applicable requirements of the Clean Air Act for purposes of Section 110(l) of the Act, Section 110(l) is satisfied here because in both its interim stage and its final stage, the BART alternative will achieve greater reasonable progress toward natural visibility conditions than would be achieved through the installation, operation, and maintenance of BART. Therefore, the BART Alternative operating strategies will not interfere with the requirements of the Regional Haze program and do not violate Section 110(l).

3.5 Comments on SO_2 and NOx Emission Limits

Comment: *One commenter requested ADEQ to work with SRP to explore ongoing SO_2 control equipment operations and fuel supply procedures that could achieve the maximum, reliable emissions reductions during the entire implementation period of the interim strategies (from 2017 to final installation of SCR or shut down of Unit 1). Another commenter reviewed actual SO_2 emissions data during 2014 through mid-2016 for CGS units and found that the SO_2 emissions for both units were 0.042 lb/MMBtu, much lower than the emission limits of 0.060-0.080 lb/MMbtu proposed by SRP under its IS1-IS4 options. The commenter stated that there was significant additional SO_2 reduction that might be possible for both units beyond SRP's proposal.*

Response: The criteria established for approval of a BART alternative at 40 CFR § 51.308(e) do not require the maximum achievable emissions reductions at a BART eligible source as suggested by the commenter. The BART alternative that was initially proposed by SRP and was the basis for ADEQ's proposed determination, as discussed in the TSD, included two operating scenarios, each of which would provide greater reasonable progress toward natural visibility conditions. To address the comments, in the application addendum described in Section 2 herein, the BART alternative for CGS has been revised by lowering the permitted SO_2 emission rate limit for each unit from 0.080 lb/MMBtu to 0.060 lb/MMBtu (on a 30-boiler-operating-day average) as well as adding a plant-wide annual SO_2 emission cap of 1,970 tons. The emission limit of 0.060 lb/MMBtu would become effective December 5, 2017, and would apply at each unit in both the interim phase and the final phase of the BART alternative, without any termination date. The annual cap would apply to the calendar year starting January 1 and ending December 31 of each year. The first calendar year in which the annual cap is effective starts January 1, 2018, and the annual cap would also apply in each year thereafter, in both the interim phase and the final phase of the BART alternative, without any termination date.

Reflecting the proposal made in the addendum, the revised BART alternative removes the interim control strategy IS1 but retains the interim control strategies IS2, IS3 and IS4 (see Table 1). For IS3 and IS4, the SO_2 emission limits are kept unchanged because the SO_2 emission limits under those two strategies are already equal to or lower than 0.060 lb/MMBtu (on a 30-boiler-operating-day average). For IS2, the SO_2 emission limit in the final BART alternative, as revised in response to comments, decreases from 0.070 lb/MMBtu to 0.060 lb/MMBtu (hereinafter referred to as "Modified IS2").

The proposed revisions do not affect the interim control strategies IS3 and IS4 since the new SO_2 limit of 0.060 lb/MMBtu is equal to or higher than that allowed by IS3 and IS4, and the annual plant-wide emission cap of 1,970 tons is higher than the annual emissions estimated for IS3 and IS4 (see TSD pg. 10). Plant-wide annual SO_2 emissions under Modified IS2 are expected to be even lower than plant-wide annual SO_2 emissions under IS4 due to the fact that Modified IS2 has an identical SO_2 emission rate limit but a longer curtailment period than IS4 does. Therefore, plant-wide annual SO_2 emissions under Modified IS2 are expected to be below the annual plant-wide SO_2 emissions cap of 1,970 tons per year.

The proposed revisions will significantly reduce SO_2 emissions as compared to the BART when the final strategy under the BART Alternative (SCR or shutdown) is in place. As shown in the SIP TSD, the combined annual emissions of Unit 1 and Unit 2 for the BART were estimated as 2,651 tons per year (tpy) (see TSD pg. 11). When SCR is in place, the revised annual cap is projected to reduce plant-wide SO_2 emissions by 681 tpy (or approximately 26%) compared to the BART. Alternatively, if Unit 1 is shut down, the revised annual cap is projected to reduce plant-wide SO_2 emissions by 1,571 tpy (or approximately 59%) compared to the BART. For detailed calculations, please see Table 3.

Table 3 Annual SO_2 Emissions for Revised BART Alternative

Scenario	Unit	Annual Emission (tons/year)	Combined Emission of Unit 1 and Unit 2 (tons/year)	Emission Reduction Relative to BART (tons/year)
BART Control Strategy	Unit 1	1,285[a]	2,651[a]	-
	Unit 2	1,366[a]		
Revised BART Alternative -SCR	Unit 1	964[b]	1,970 (annual emission cap)	681
	Unit 2	1,025[b]		
Revised BART Alternative - Shutdown	Unit 1	0	1,080 (annual emission cap)	1,571
	Unit 2	1,025[b]		

[a] *TSD pgs. 10,11.*
[b] *Assuming the same heat input and annual utilization rate, the emission rate for Revised BART Alternative = the emission rate for BART Control Strategy * (0.06/0.08).*

As shown in the SIP TSD, the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring data collected from CGS-affected Class I areas indicate that ammonium sulfate plays a more significant role in visibility impairment than ammonium nitrate in those areas. As ADEQ determined, the ratio of SO_2-attributed visibility extinction to NOx-attributed visibility extinction averaged over all Class I areas potentially affected by CGS is 4.2:1. ADEQ also observed that ammonium sulfate accounts for 15%-30% of aerosol light extinction whereas ammonium nitrate's contribution is only 4%-8% for Class I areas potentially affected by CGS. Compared to the original proposal, the revised BART Alternative will further reduce SO_2 emissions to provide additional visibility improvement at affected Class I areas.

Comment: *One commenter reviewed actual NOx emissions data during 2014 through mid-2016 for CGS units and found that the 95th percentile 30-day average was 0.30 lb/MMBtu. The commenter stated no reductions are being proposed in the NOx rate in lb/MMBtu in the noncurtailed periods under IS1-IS4.*

Response: In the BART Alternative, the NOx emission limits for Unit 1 for IS2, IS3, and IS4 are 0.320 lb/MMBtu, 0.320 lb/MMBtu, and 0.310 lb/MMBtu (on a 30-boiler-operating-day average basis), respectively. (Note that IS1 is removed.) Relative to the actual NOx emission data the commenter provided, there is little opportunity for CGS to further reduce

NOx emissions from Unit 1. Although the historic 95th percentile emission rate may be 0.30 lb/MMBtu, it would not be appropriate to set an emission limit at that level. It is necessary to add a margin of compliance when setting emission limits so that a source has sufficient operational flexibility. As discussed elsewhere in this document, the BART Alternative has been revised to further reduce SO_2 emissions to achieve greater visibility benefits compared to BART.

Appendix A: Memorandum SRP Submitted to ADEQ Regarding Numerical Noise Issues Associated with CAMx Modeling

RAMBOLL ENVIRON

Date September 22, 2016

MEMORANDUM

To:
From: Lynsey Parker and Ralph Morris
Subject: To address the EPA comment regarding whether the CGS Better-than-BART CAMx analysis is influenced by numerical "noise".

Purpose and summary of analysis

This analysis was performed to address EPA's comment regarding whether the CAMx results for the CGS Better-than-BART (BTB) scenarios are influenced by numerical "noise" which may be smoothed out by averaging the results over multiple days. CAMx results were plotted for total visibility impacts, as well as nitrate and sulfate visibility impacts separately, for two individual days which were selected based on the magnitude of the CGS impacts at the most affected Class I areas on those days. Spatial plots of visibility impacts and differences in visibility impacts between various emission scenarios, show reasonable patterns resembling dispersed plumes with smooth visibility impact gradients, indicating that model results are not influenced by noise. A close examination of the differences between two model runs with identical emission rates suggests that the noise threshold is bounded by ± 0.0000005 dv (±5e-7). This is one to two orders of magnitude lower than the smallest results from the CGS two-prong BTB test.

Approach

Two days from the annual CAMx simulation were identified based on their sizable contribution to the average best 20% (B20%) and worst 20% (W20%) delta deciviews. The methodology for the selection of days is described below. For the two selected days, spatial plots were generated to report delta deciviews for each emissions scenario: Baseline, EPA BART, CGS scenarios [BTB1, BTB2, BTB3, BTB4], and spatial plots of the differences between the scenarios analogous to the Prong 1 and Prong 2 BTB tests were generated. Emissions rates for the six scenarios, along with the shutdown periods for unit 1 are presented in Table 1. Since January 13 falls within the unit 1 shutdown period, emissions from unit 1 on that day (and previous days) are zero. Note that the differences plots are not the true Prong 1 and Prong 2 BTB tests, since those tests are defined to be applied to the average of B20% and W20% days and not individual days. In addition, to provide a deeper understanding of the results, delta deciviews and "Prong 1" and "Prong 2" differences plots were also calculated based on CGS nitrate-only impacts and CGS sulfate-only impacts. All spatial plots were examined for evidence of numerical "noise".

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Table 1. CGS emission rates and unit 1 shutdown periods for the CGS Baseline, EPA BART and four proposed alternative Better-than-BART emission scenarios. (Report Table 4-1)

Scenario	NO_X (lb/MMBtu)		SO_2 (lb/MMBtu)		unit 1 Shutdown Period
	unit#1	unit#2	unit#1	unit#2	
Baseline	0.320	0.080	0.080	0.080	None
EPA BART	0.065	0.080	0.080	0.080	None
BtB1	0.320	0.080	0.080	0.080	Oct 1 – Apr 15
BtB2	0.320	0.080	0.070	0.070	Oct 21 – Jan 31
BtB3	0.320	0.080	0.050	0.050	Nov 21 – Jan 20
BtB4	0.310	0.080	0.060	0.060	Nov 21 – Jan 20

<u>Method for selection of individual days:</u>

1) Identify the Class I areas with maximum CGS visibility impacts for the Baseline scenario from Table 2
   a) For the B20% days, Superstition Wilderness has the maximum delta deciview impact
   b) For the W20% days, Mount Baldy Wilderness has the maximum delta deciview impact
2) From intermediate post-processing files, the single B20% and W20% days with highest delta deciview impacts at Superstition Wilderness and Mount Baldy Wilderness areas, respectively, were identified and are presented in Table 3
   a) Superstition Wilderness (supe) highest single B20% day delta deciview impact was on January 13 (2008013)
   b) Mount Baldy (moba) highest single W20% day delta deciview impact was on May 15 (2008136)

Table 2. CGS visibility impacts from Baseline emissions. (Report Table 4-3)

	Delta Dv		
	Average Best 20% Days*	Average Worst 20% Days*	Annual Average
Class I Area	Absolute (dv)	Absolute (dv)	Absolute (dv)
Bandalier NM	0.0063	0.0170	0.0096
Bosque	0.0063	0.0049	0.0104
Chiricahua NM	0.0081	0.0015	0.0040
Chiricahua Wild	0.0092	0.0015	0.0041
Galiuro Wild	0.0051	0.0016	0.0031
Gila Wild	0.0151	0.0030	0.0140
Grand Canyon NP	0.0006	0.0030	0.0044
Mazatzal Wild	0.0167	0.0039	0.0053
Mesa Verde NP	0.0013	0.0063	0.0071
Mount Baldy Wild	0.0209	**0.0172**	0.0226
Petrified Forest NP	0.0087	0.0147	0.0406
Pine Mountain Wild	0.0133	0.0025	0.0052
Saguro NP	0.0041	0.0013	0.0023
San Pedro Parks Wild	0.0080	0.0134	0.0126
Sierra Ancha Wild	*	*	0.0087
Superstition Wild	**0.0224**	0.0027	0.0060
Sycamore Canyon Wild	0.0058	0.0037	0.0050
Maximum	**0.0224**	**0.0172**	0.0406
Cumulative (sum)	0.1521	0.0982	0.1649
Average	0.0095	0.0061	0.0097
Minimum	0.0006	0.0013	0.0023

** Best and Worst Days of Monitored visibility, from MATS (IMPROVE) database, some sites/years lack data*

Table 3. Highest individual baseline visibility impact.

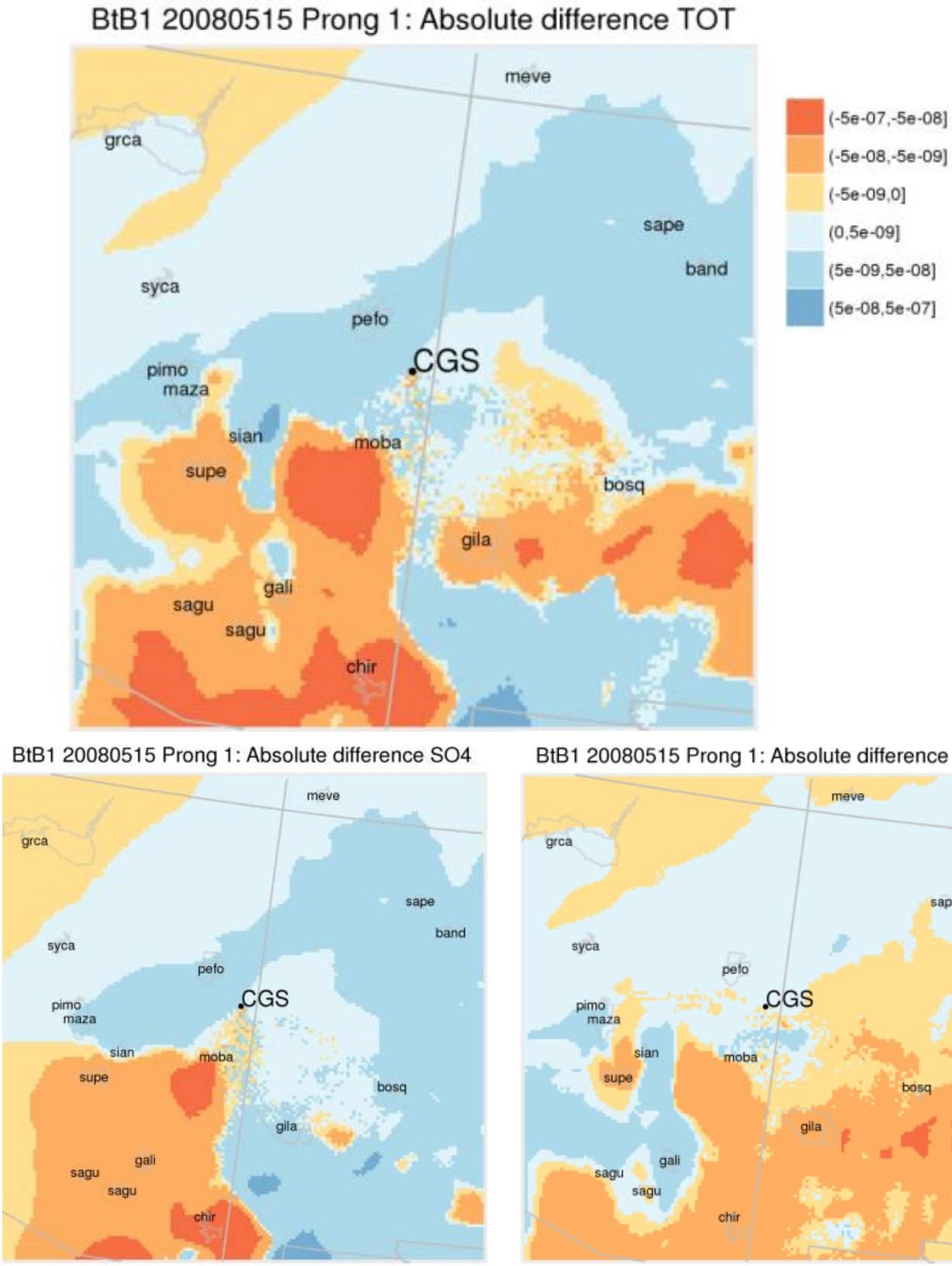
Class I Area	Day Type	date	date	bext	delta deciview	Back bext	bso4	bno3	bnhy
supe	B20% Day	2008013	Jan 13	0.2211	0.1427	15.3829	0.0773	0.0086	0.1352
moba	W20% Day	2008136	May 15	0.1357	0.0979	13.7916	0.0566	0.0307	0.0484

Comparison of results for two model runs with identical emissions

The only spatial plots that show evidence of numerical "noise", (identified by pixilation in the plots) are the "Prong 1" plots for the CGS BTB1 scenario on May 15 which is a day when the Baseline and BTB1 emissions are identical. Results of "Prong 1" for this case are essentially zero throughout the modeling domain and across all Class I areas. This result indicates that the numerical "noise" threshold is bounded by ± 0.0000005 dv (±5e-7). This is one to two orders of magnitude lower than the smallest result from the CGS two-prong BTB test.

Figure 1 presents the differences between BTB1 scenario and the baseline scenario (i.e. Baseline minus BTB1, which is the Prong 1 Better-than-BART test applied to a single day rather than an average over the B20% or W20% days) for total visibility impact, as well as the sulfate and nitrate contributions. The observed visibility differences are very small, and some pixilation occurs at values of 5e-8 dv. All of the differences are bounded by a value of 5e-7 dv, which is an upper bound estimate for the "noise" observed. This impact level is one to two orders of magnitude lower than the smallest result from the CGS two-prong BTB test. This indicates that the CAMx modeling results for the BTB test are valid numerical results, and that the differences between the scenarios (i.e. the Prong 1 and Prong 2 results) are not artifacts of numerical "noise" but represent valid modeled responses to different CGS emissions scenarios.

Figure 1. Comparison of "Prong1" BTB1 (Baseline minus BTB1) May 15.



Analysis of results at Superstition Wilderness on January 13 and Mount Baldy Wilderness on May 15.

To supplement the spatial plots in the next section and to facilitate analysis of the results, this section provides tabulated results at the two most affected Class I areas on days selected for the analysis. Table 4 reports detailed results for Superstition Wilderness on January 13 and Mount Baldy Wilderness on May 15. The table reports delta deciviews for each emissions scenario, as well as CGS sulfate extinction, CGS nitrate extinction, CGS nonhydrogenous extinction (as both absolute extinction and percentage of total extinction), and total CGS extinction. The delta deciview values in Table 4 are comparable to the relevant Class I area total delta deciviews reported in the spatial plots in the next section, for each of the emission scenarios. Note that on January 13 sulfate extinction is much larger than nitrate extinction for all scenarios, and nitrate extinction is a small percentage of total extinction (2.2 % to 6.0 %).

Table 4. Detailed visibility impacts: delta deciview, sulfate, nitrate, nonhydrogenous (i.e. other) extinction at Superstition Wilderness (January 13) and Mount Baldy Wilderness (May 15) each emission scenario.

Scenario	date	bext	delta dv	Back bext	bso4	bno3	bnhy	bso4 as % of CGS ext	bno3 as % of CGS ext	bnhy as %e of CGS ext
Superstition Wilderness										
Baseline	2008013	0.2211	0.1427	15.3829	0.0773	0.0086	0.1352	35.0%	3.9%	61.1%
EPA BART	2008013	0.1979	0.1278	15.3829	0.1064	0.0043	0.0872	53.8%	2.2%	44.1%
BtB1	2008013	0.1246	0.0807	15.3829	0.0290	0.0069	0.0887	23.3%	5.5%	71.2%
BtB2	2008013	0.1215	0.0786	15.3829	0.0256	0.0069	0.0889	21.1%	5.7%	73.2%
BtB3	2008013	0.1152	0.0746	15.3829	0.0190	0.0069	0.0894	16.5%	6.0%	77.6%
BtB4	2008013	0.1160	0.0751	15.3829	0.0221	0.0067	0.0872	19.0%	5.8%	75.2%
Mount Baldy Wilderness										
Baseline	2008136	0.1357	0.0979	13.7916	0.0566	0.0307	0.0484	41.7%	22.6%	35.7%
EPA BART	2008136	0.1080	0.0780	13.7916	0.0621	0.0129	0.0330	57.5%	11.9%	30.6%
BtB1	2008136	0.1357	0.0979	13.7916	0.0566	0.0307	0.0484	41.7%	22.6%	35.7%
BtB2	2008136	0.1297	0.0936	13.7916	0.0504	0.0309	0.0485	38.8%	23.8%	37.4%
BtB3	2008136	0.1178	0.0851	13.7916	0.0377	0.0313	0.0488	32.0%	26.5%	41.4%
BtB4	2008136	0.1224	0.0884	13.7916	0.0441	0.0304	0.0479	36.0%	24.8%	39.1%

To analyze visibility impacts responses due to changes in emissions for each of the days, refer to Table 1 for emission rates and Table 4 for the visibility impacts due to nitrate, sulfate and "other" visibility-impairing components. Recall that on January 13, CGS unit 1 is shut down for all CGS BTB scenarios and therefore the CGS emissions are from unit 2 only. Refer to the CGS Report (2016), for additional emissions information, including primary SO_4 emission rates and other pollutants.

Analysis of January 13 response to emissions reductions at Superstition Wilderness: "Prong 1".

- Reduction in SO_2 emissions from baseline to BTB scenarios leads to lower bso4.
- Reduction in NOx emissions from baseline to BTB scenarios leads to lower bno3 (by a small amount)
- Net effect: Lower total bext for BTB scenarios compared to Baseline.

Analysis of January 13 response to emissions reductions at Superstition Wilderness: "Prong 2".

- Reduction in SO_2 emissions from EPA BART to BTB scenarios leads to lower bso4.
- Reduction in NOx emissions from EPA BART to BTB scenarios however higher bno3
    - This may be attributable to increased available ammonia for nitrate formation since less ammonia used by sulfur neutralization
- Net effect: Lower total bext for BTB compared to EPA BART. (Note that nitrate is only a small percentage of total extinction on this day).

Analysis of May 15 response to emissions reductions at Mount Baldy Wilderness: "Prong 1".

- Same or lower SO_2 emissions from baseline to BTB scenarios leads to same or lower bso4.
- Same or similar NOx emissions from baseline to BTB scenarios leads to similar bno3
- Net effect: Same total bext (~pass for the BTB Prong 1 test since "no worsening" for Prong 1) or lower total bext for BTB compared to Baseline.

Analysis of May 15 response to emissions reductions at Mount Baldy Wilderness: "Prong 2".

- Same or lower SO_2 emissions from EPA BART to BTB scenario leads to slightly lower or lower bso4 (recall, EPA BART has additional SO_4 emissions compared to BTB cases).
- Increase in NOx emissions from EPA BART to BTB scenario leads to higher bno3
- Net effect: Slightly higher total Bext for BTB compared to EPA BART
    - Note that the BTB Prong 2 test applies to the average of all B20% and W20% days and not a single day as shown in this example. In addition the BTB test also applies to the average of many Class I areas and not a single area as is presented here. See the spatial plots in the next section for this day to observe that some Class I areas have a Prong 2 net improvement on this day and some Class I areas have degradation.

Spatial plots for January 13 and May 15.

Figure 2, Figure 3, and Figure 4 present spatial plots of CAMx modeled CGS visibility impacts on January 13 for the Baseline, EPA BART, BTB1, BTB2, BTB3, and BTB4 scenarios. The visibility impacts are represented in terms of haze index (i.e. delta deciviews (ddv)). The top panels display delta deciviews based on all CGS aerosol components (standard delta deciview), the middle and bottom panels display delta deciviews based on CGS nitrate and sulfate concentrations only. On January 13, the region with highest visibility impacts is observed generally southwest of the CGS facility. The Class I areas most affected are supe (see corresponding tabulated results in Table 4), sian and moba. Note that close to the CGS source nitrate impacts may be higher than sulfate impacts (since nitrate ddv > 1 dv and sulfate ddv < 0.25 dv, for baseline), but over a broad region sulfate impacts are higher than nitrate impacts (i.e. sulfate ~ 0.025 dv – 0.1 dv and nitrate ~0.001 dv – 0.01, for baseline).

Figure 9, Figure 10, and Figure 11 are the analogous results for May 15, and show a dispersed plume south to southeast of the CGS facility. The most impacted Class I areas are moba (see corresponding tabulated results in Table 4), gila and bosq.

Figure 5 and Figure 6 present the differences between Baseline and BTB scenario delta deciviews for January 13. Blue indicates positive values where Baseline delta deciviews are higher than BTB scenario delta deciviews (i.e. BTB scenarios have a smaller visibility impact than the Baseline scenario) and red indicates the opposite result. The top panels display the differences between total delta deciviews, the middle panels displays the differences between delta deciviews based on sulfate concentrations only and the bottom panels display the difference between delta deciviews based on nitrate concentrations only. These results are similar to the Prong 1 test of the Better-than-BART test, except the actual Prong 1 test uses delta deciview averaged over the B20% days and W20% days instead of a single day (i.e. January 13). These results show predominantly blue results (i.e. lower visibility impacts for CGS BTB scenarios compare to the Baseline scenario) for total delta deciviews, as well as delta deciviews calculated based on nitrate and sulfate concentrations only, for all BTB scenarios. Recall that January 13 is during the shutdown period and emissions from unit 1 are zero for the BTB scenarios and the visibility impacts are due to emissions from unit 2 only.

Figure 12 and Figure 13 present the analogous results for May 15. May 15 is not during the shutdown period for any BTB scenarios. The BTB1 scenario has the same emissions as the baseline scenario so the differences in Figure 12 (left column; Baseline – BTB1scenario) are very small. The other BTB scenarios have lower SO_2 emissions than the baseline case, and for each of those BTB scenarios the sulfate delta deciview difference plots are predominantly blue (i.e. lower sulfate visibility impacts for CGS BTB scenarios compare to the Baseline scenario). The nitrate delta deciviews plots for BTB2 – 4 show different results based on the relative reduction of NOx and SO_2 emissions but the total delta deciview plots shows lower total visibility impacts for those three BTB scenarios compared to the Baseline case. The results in Figure 12 for the BTB1 case are presented with additional precision in Figure 1.

Figure 7 and Figure 8 present differences between the EPA BART and BTB scenario delta deciviews for January 13. As in Figure 5 and Figure 6, total delta deciview differences are presented in the top panels and sulfate and nitrate derived delta deciview differences are presented in the middle and bottom panels, respectively. These results are similar to Prong 2 of the Better-than-BART test except

the results are for a single day instead of for an average over the B20% and W20% days. These plots all show predominately blue regions for the total and sulfate delta deciview impacts and red regions for the nitrate delta deciview impacts.

Figure 14 and Figure 15 present the analogous results for May 15. On this day, there is more spatial variation across the modeling domain with some regions reporting higher CGS visibility impacts and other regions reporting lower CGS visibility impacts from the BTB scenarios compared to the EPA BART scenario particularly for the total delta deciview metric.

Figure 2. Baseline and EPA BART delta deciviews: tot, so4, no3. January 13.

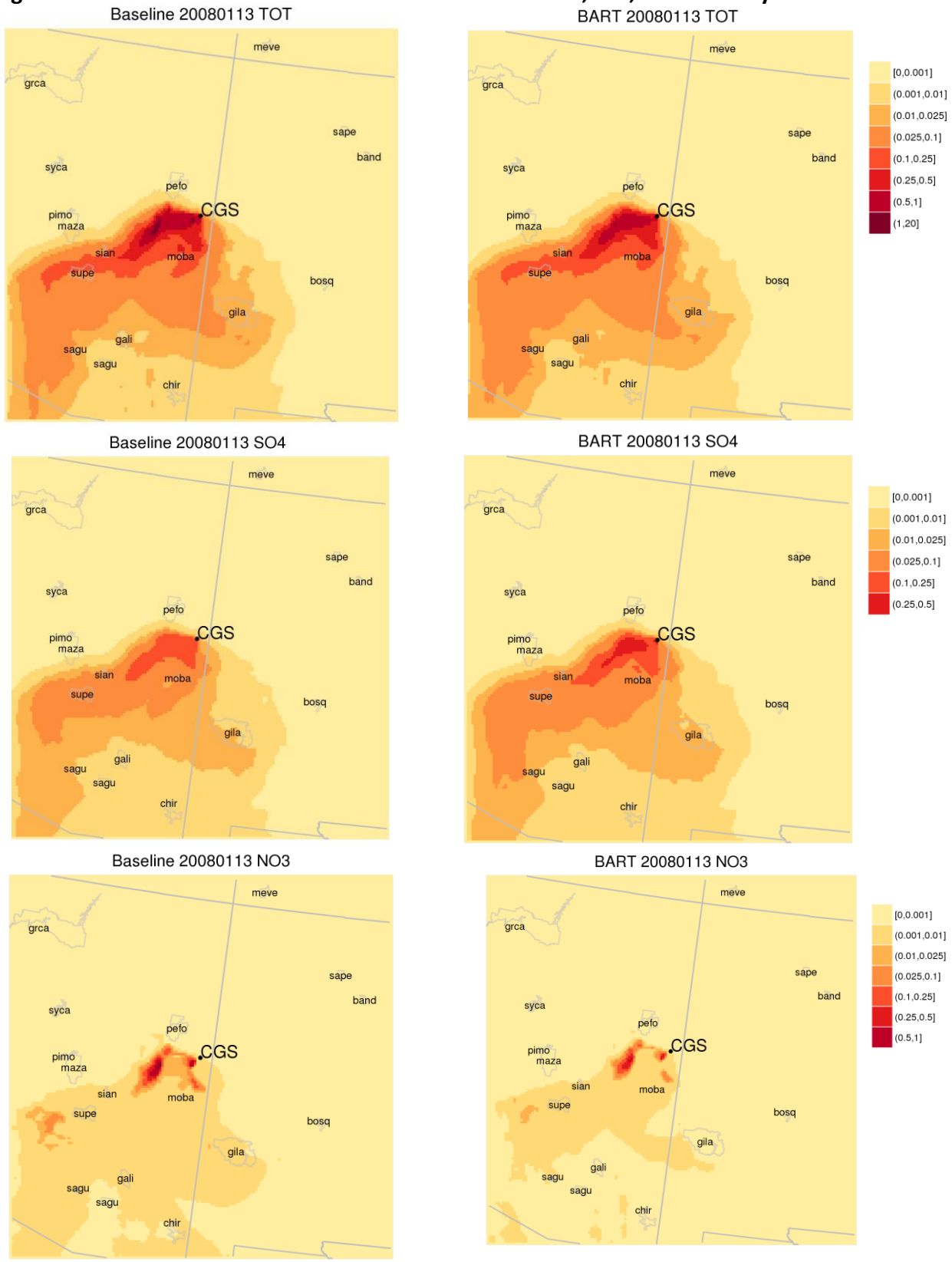


Figure 3. BTB1 and BTB2 delta deciviews: tot, so4, no3. January 13.

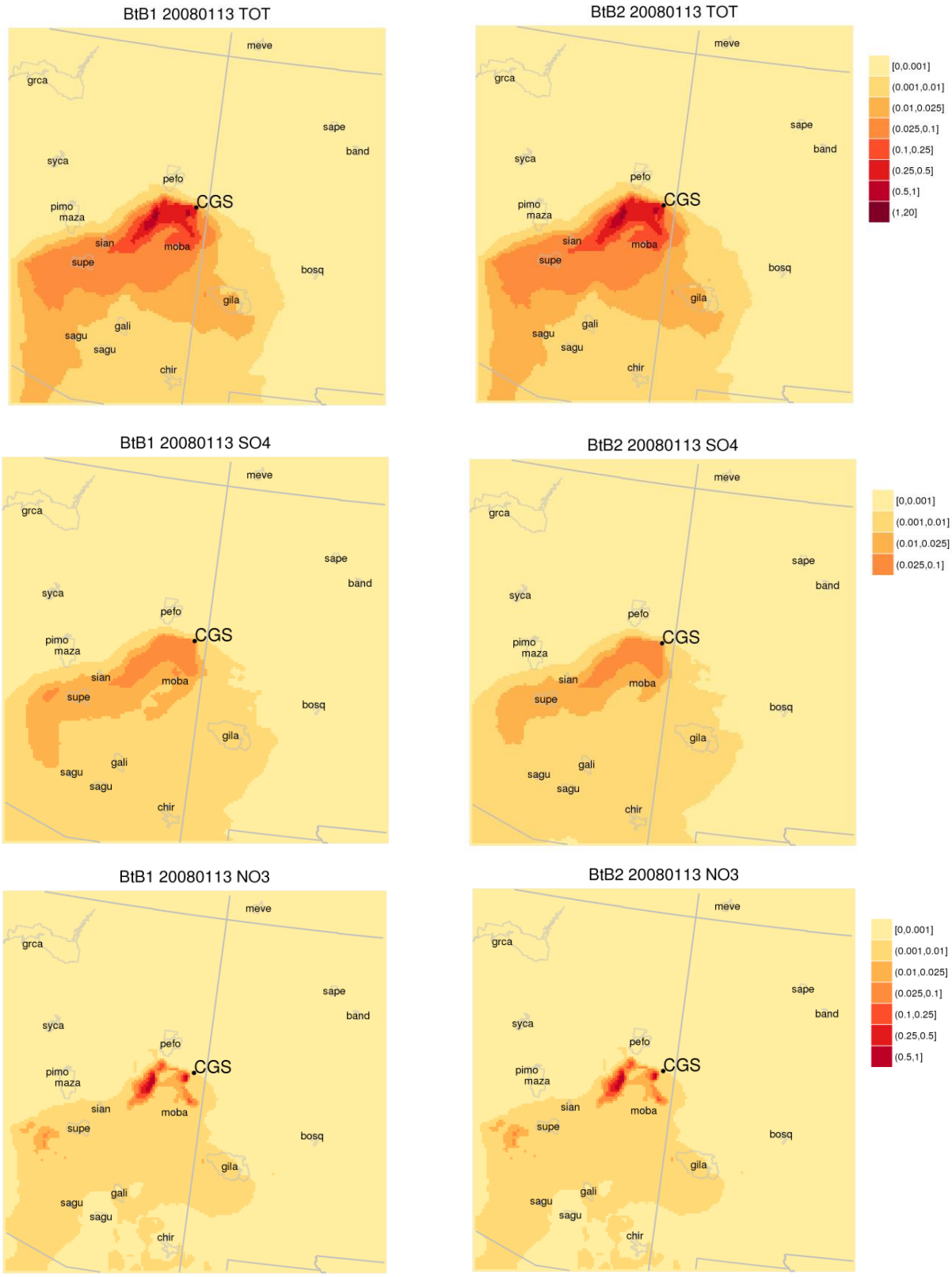


Figure 4. BTB3 and BTB4 delta deciviews: tot, so4, no3. January 13.

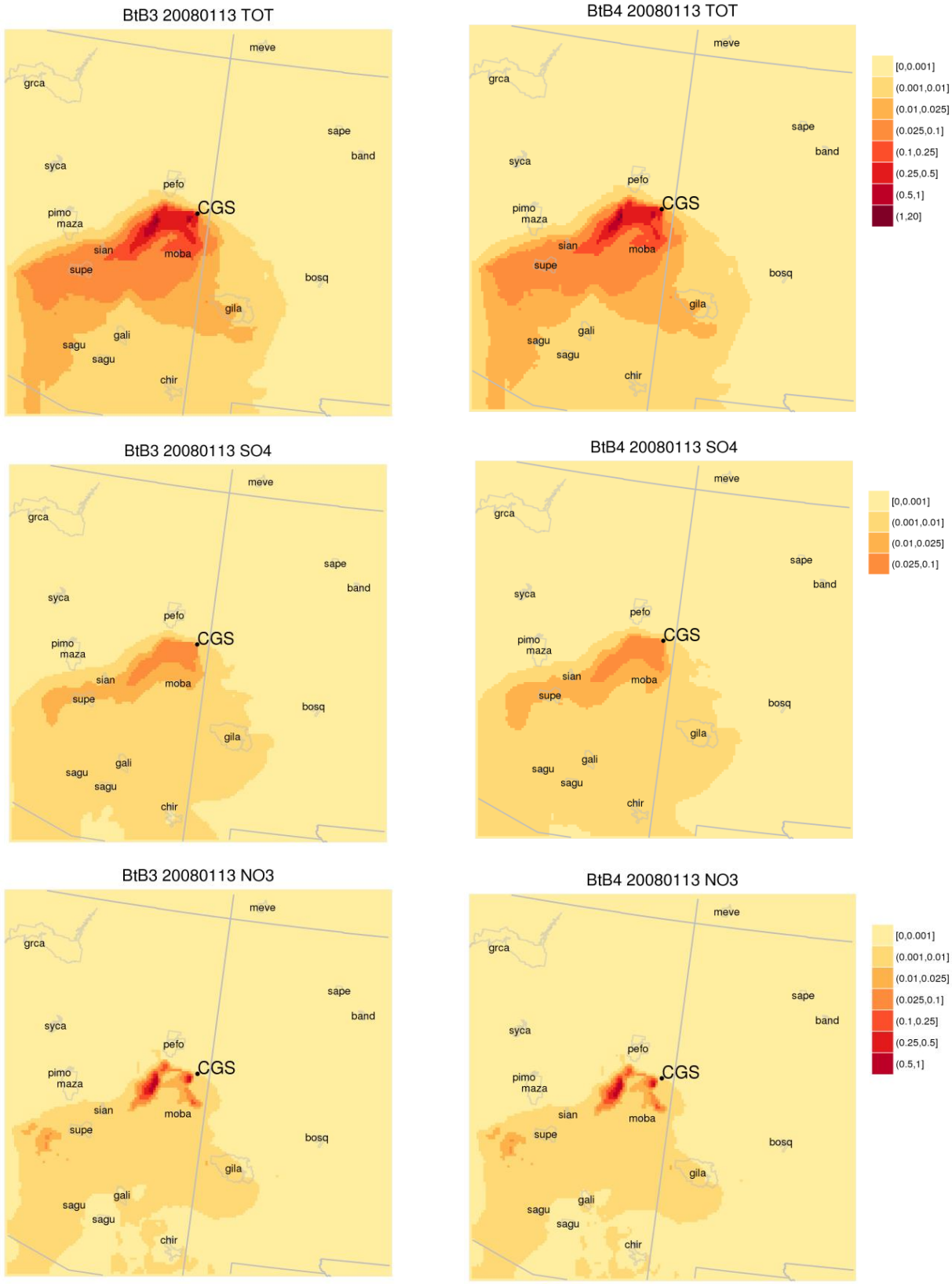


Figure 5. "Prong 1" for single day and by pollutant: BTB1 and BTB2. January 13.

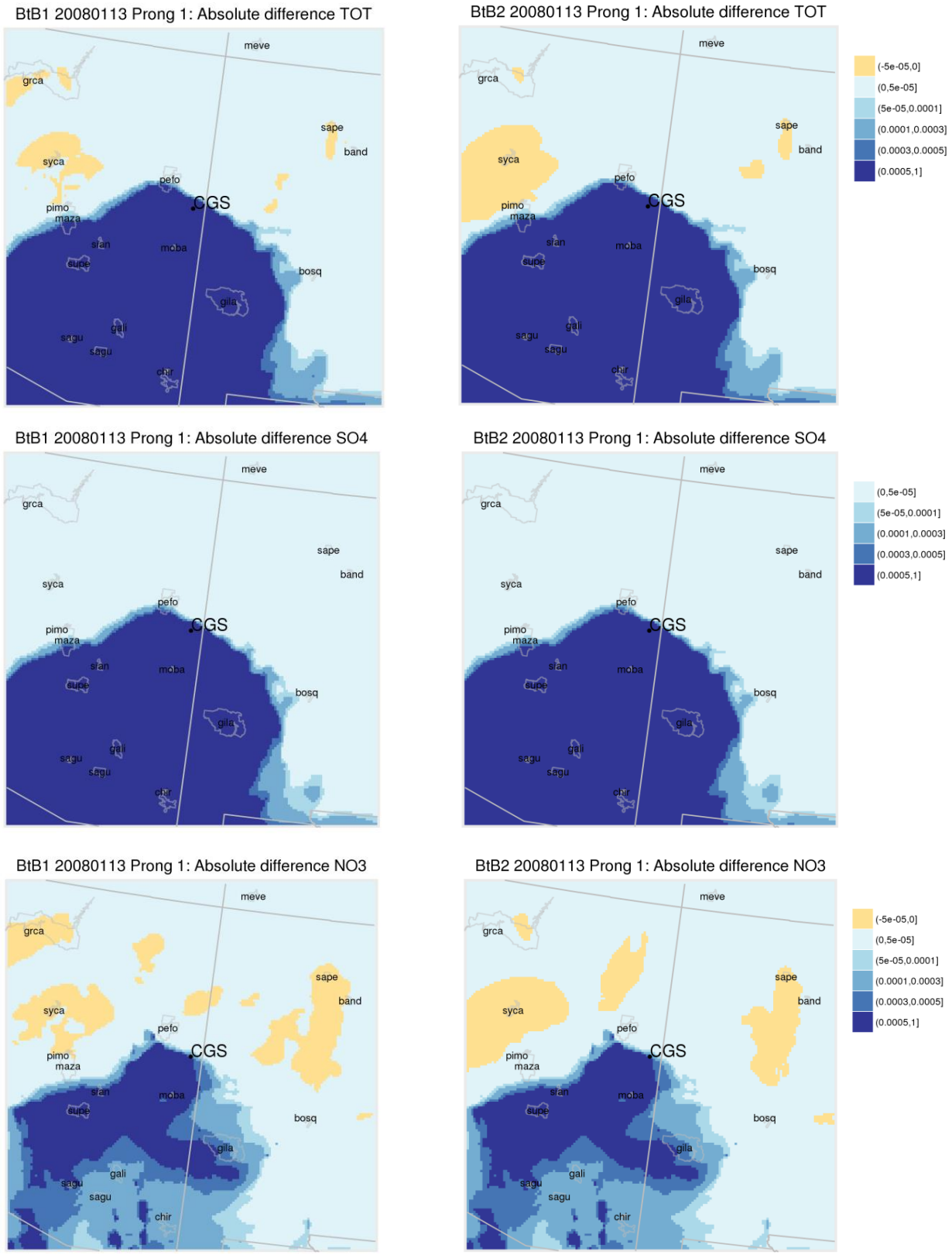


Figure 6. "Prong 1" for single day and by pollutant: BTB3 and BTB4. January 13.

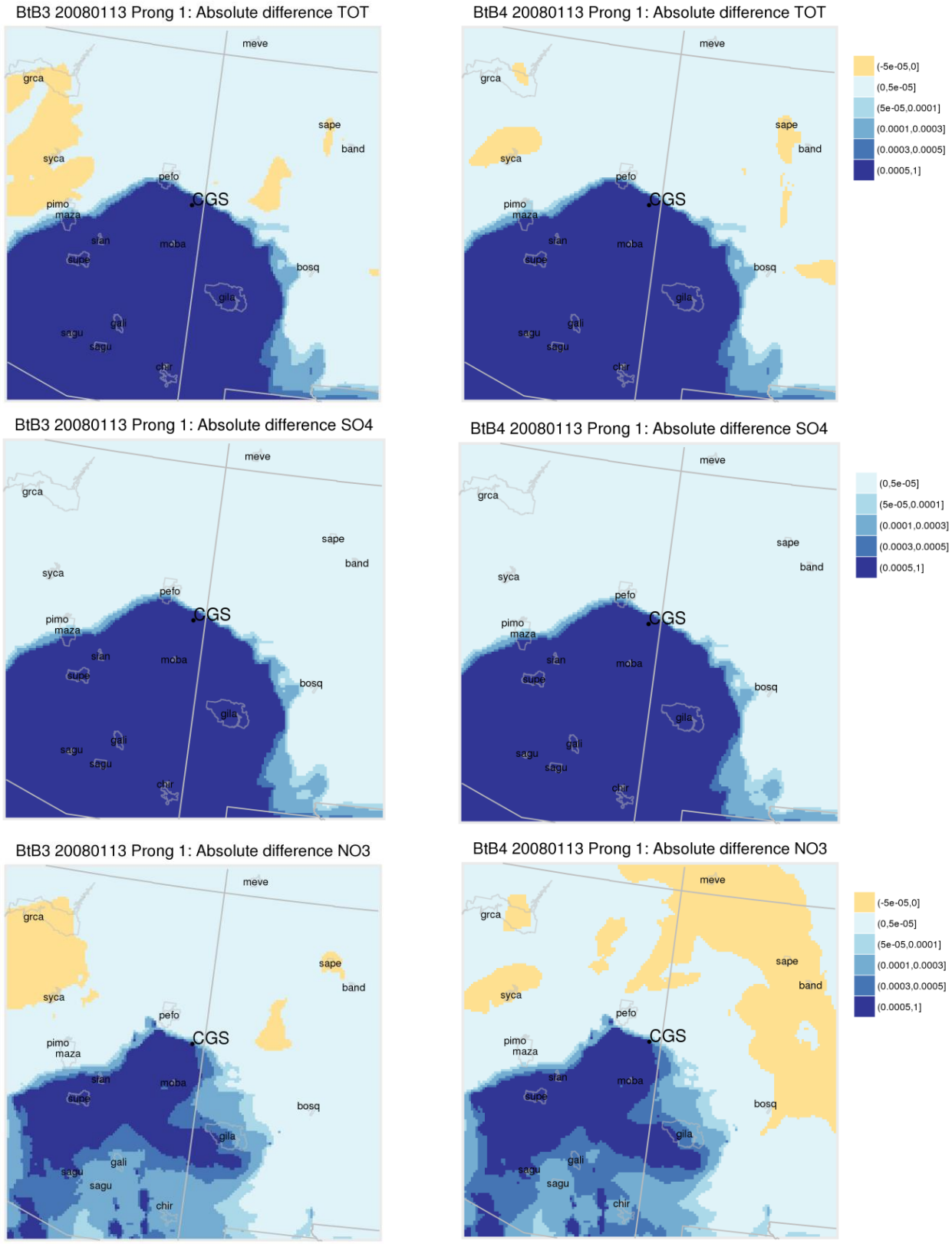


Figure 7. "Prong 2" for single day and by pollutant: BTB1 and BTB2. January 13.

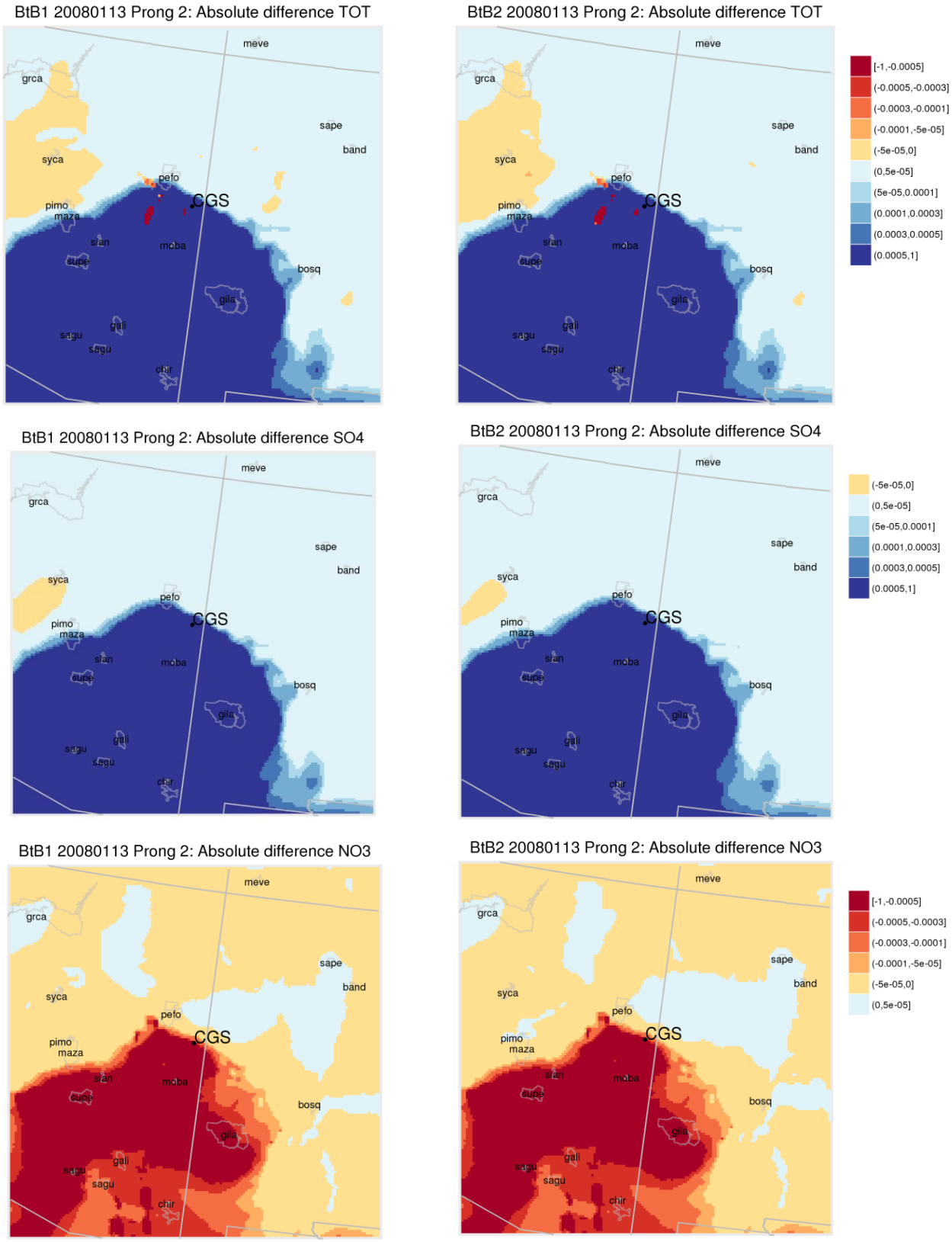


Figure 8. "Prong 2" for single day and by pollutant: BTB3 and BTB4. January 13.

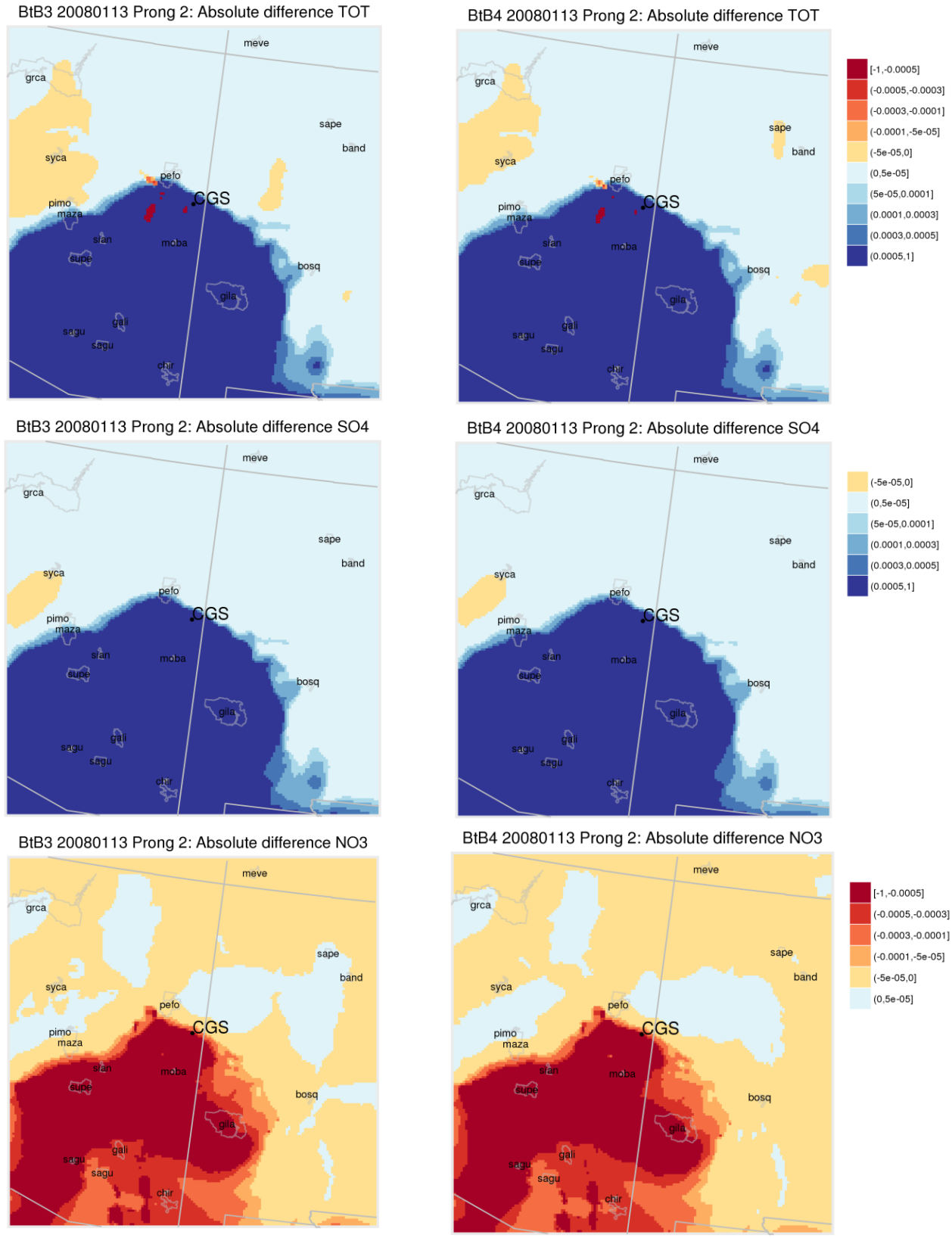


Figure 9. Baseline and EPA BART delta deciviews: tot, so4, no3. May15.

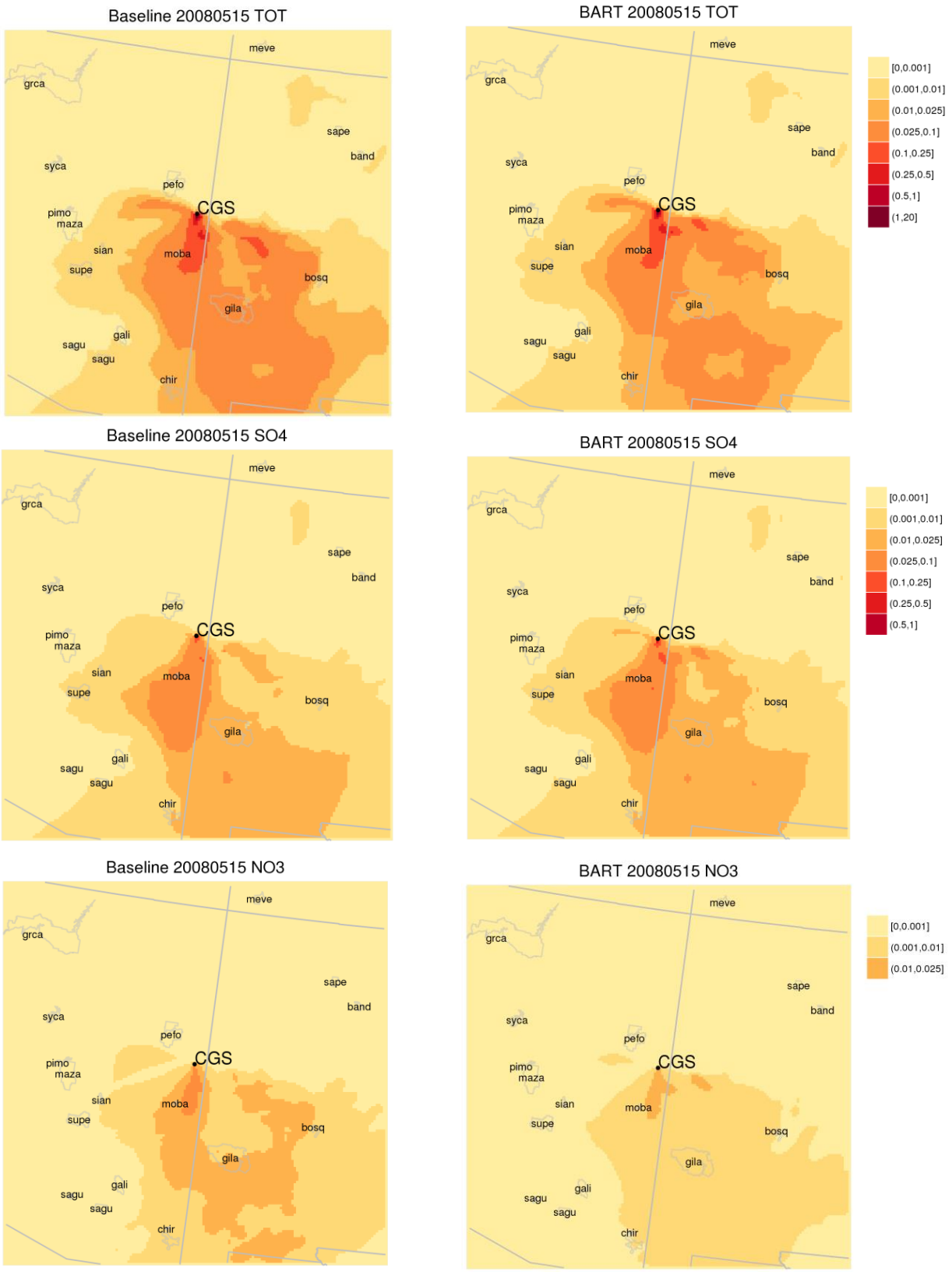


Figure 10. BTB1 and BTB2 delta deciviews: tot, so4, no3. May 15.

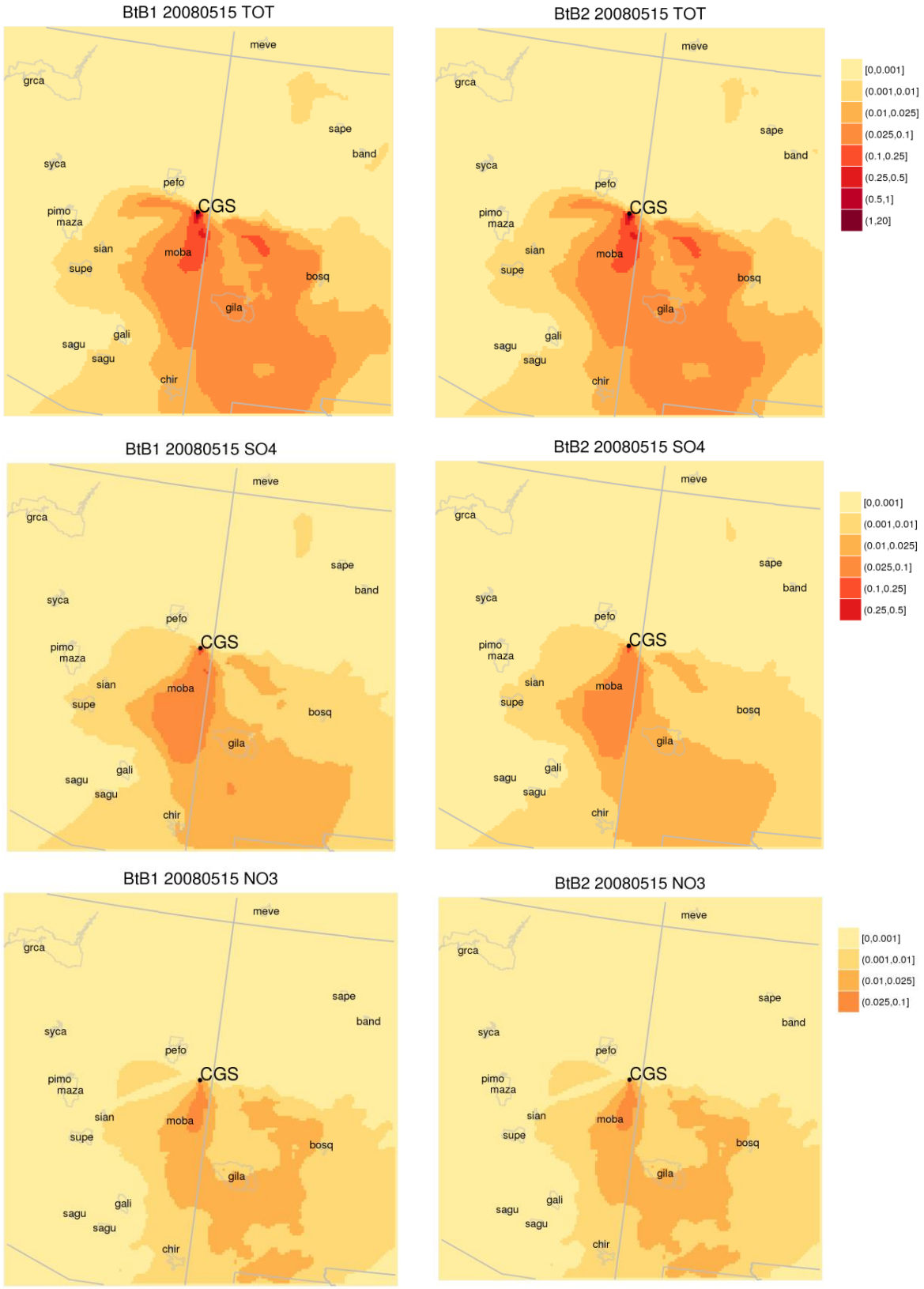


Figure 11. BTB3 and BTB4 delta deciviews: tot, so4, no3. May 15.

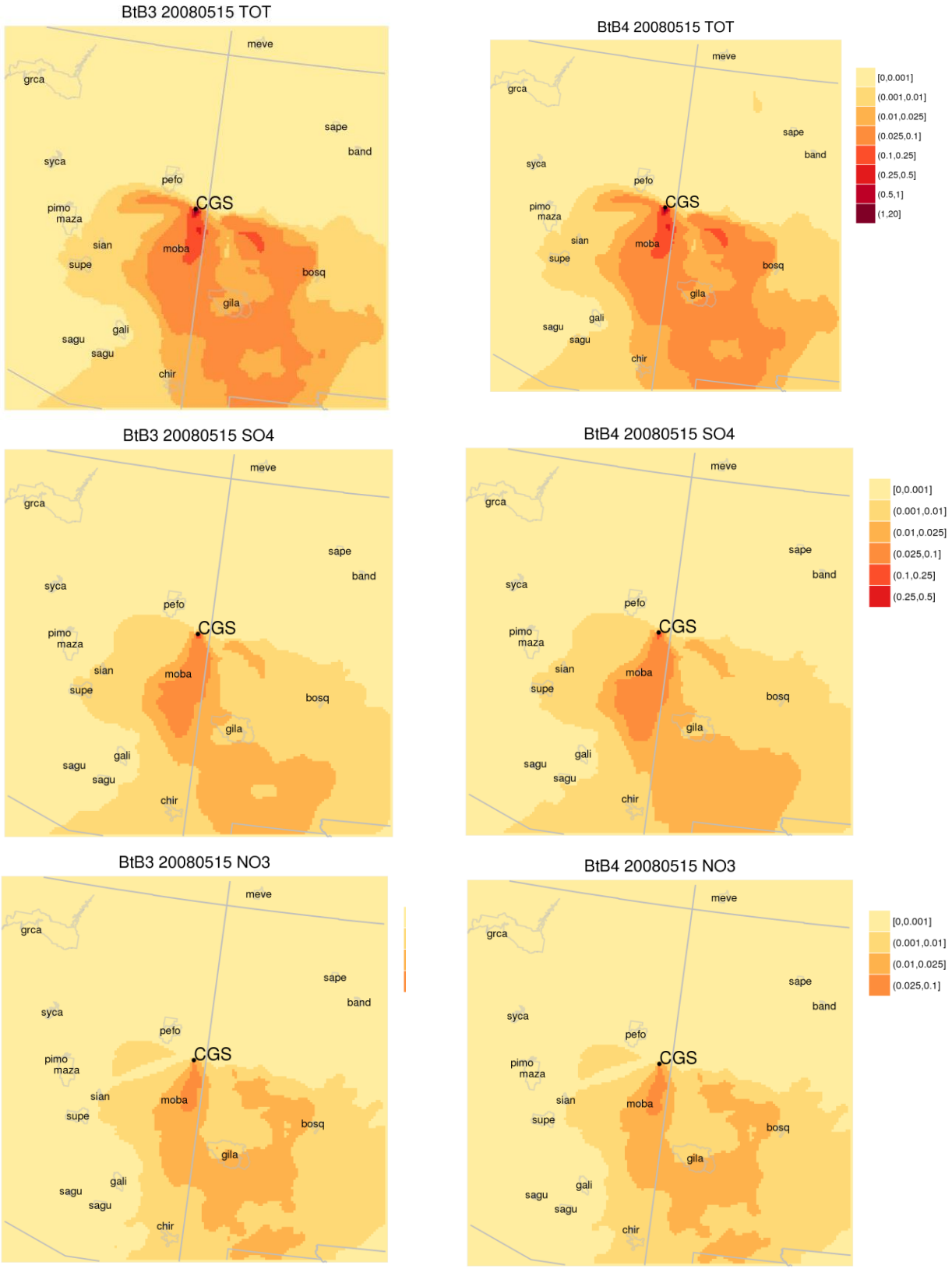


Figure 12. "Prong 1" for single day and by pollutant: BTB1 and BTB2. May 15.

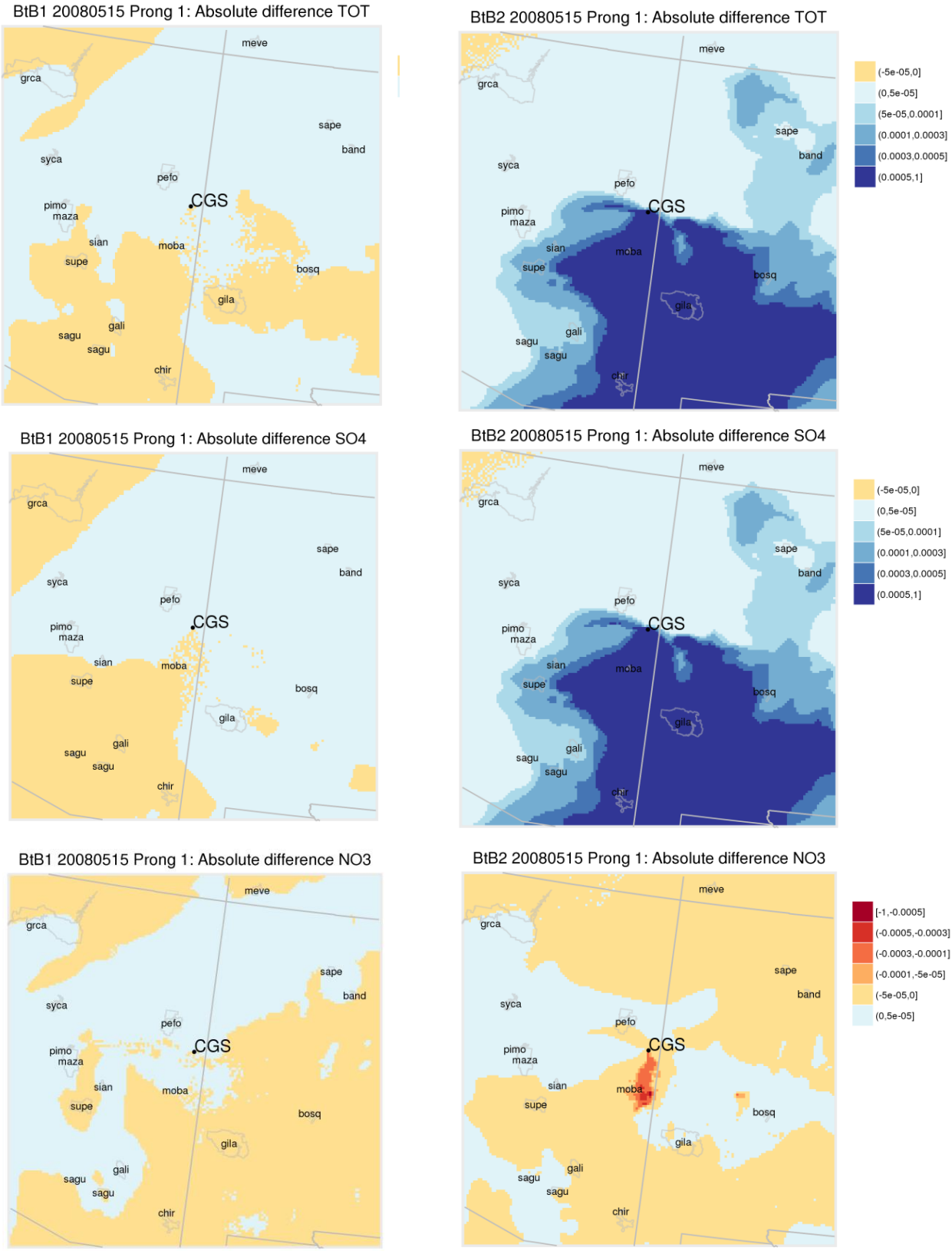


Figure 13. "Prong 1" for single day and by pollutant: BTB3 and BTB4. May 15.

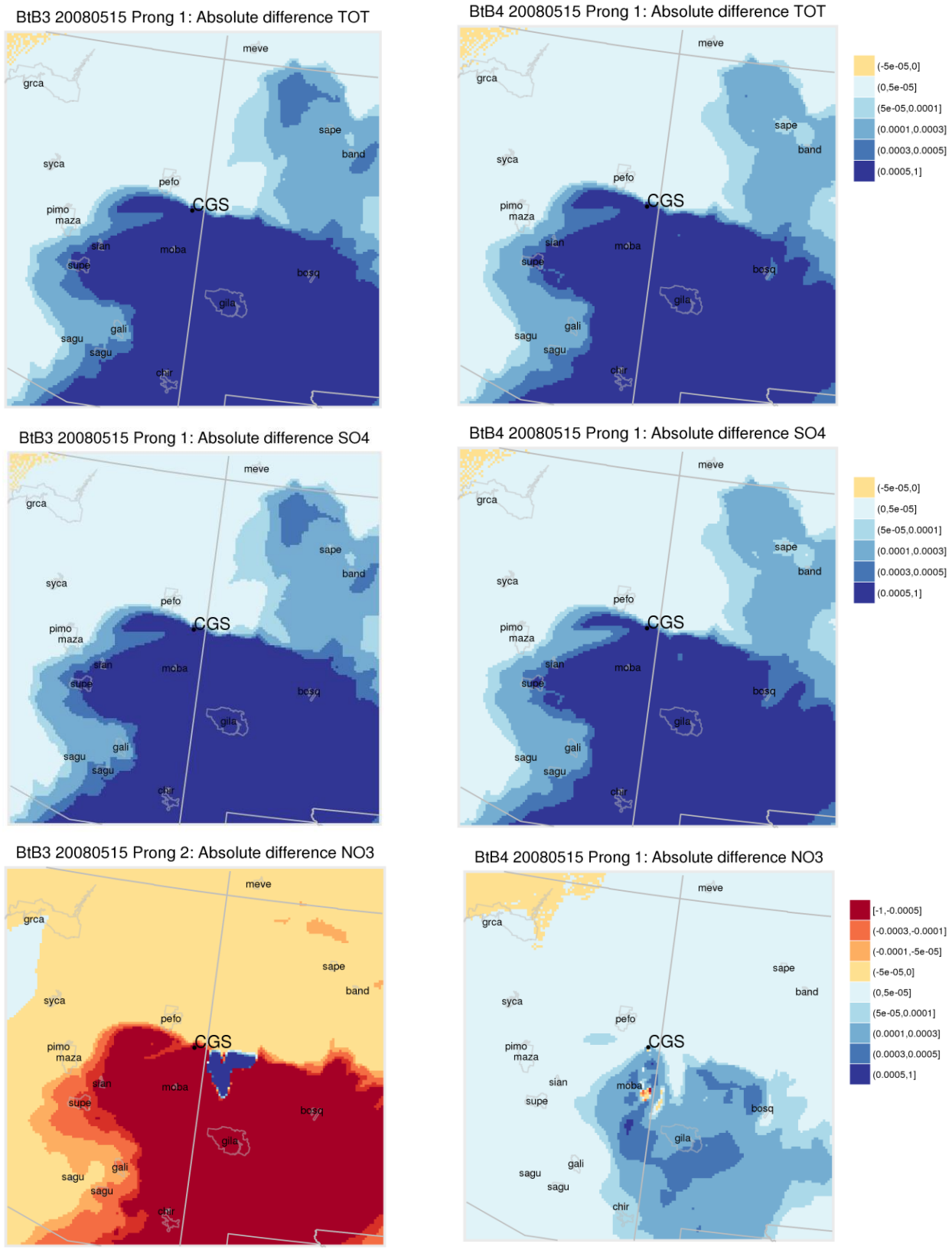


Figure 14. "Prong 2" for single day and by pollutant: BTB1 and BTB2. May 15.

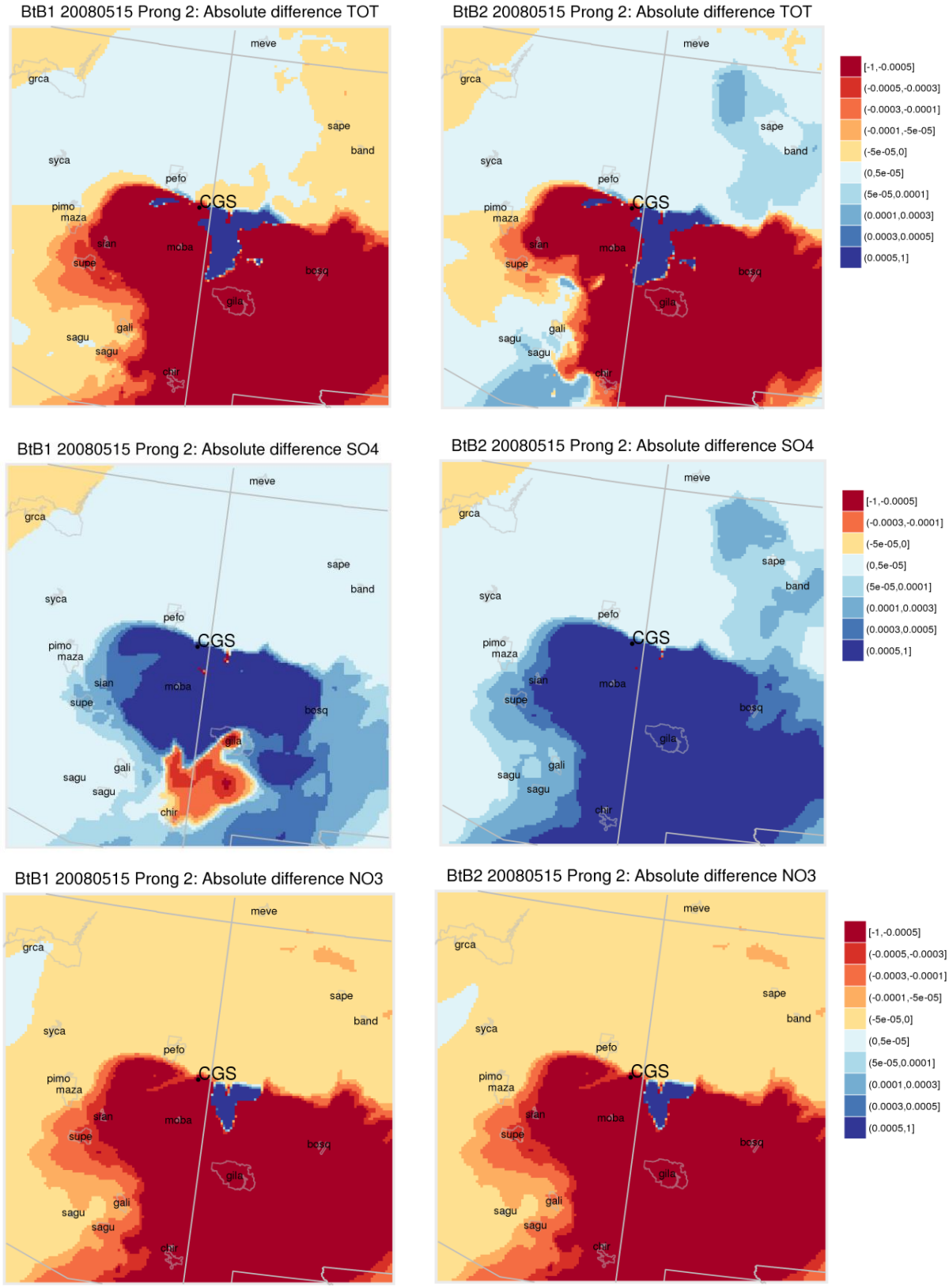
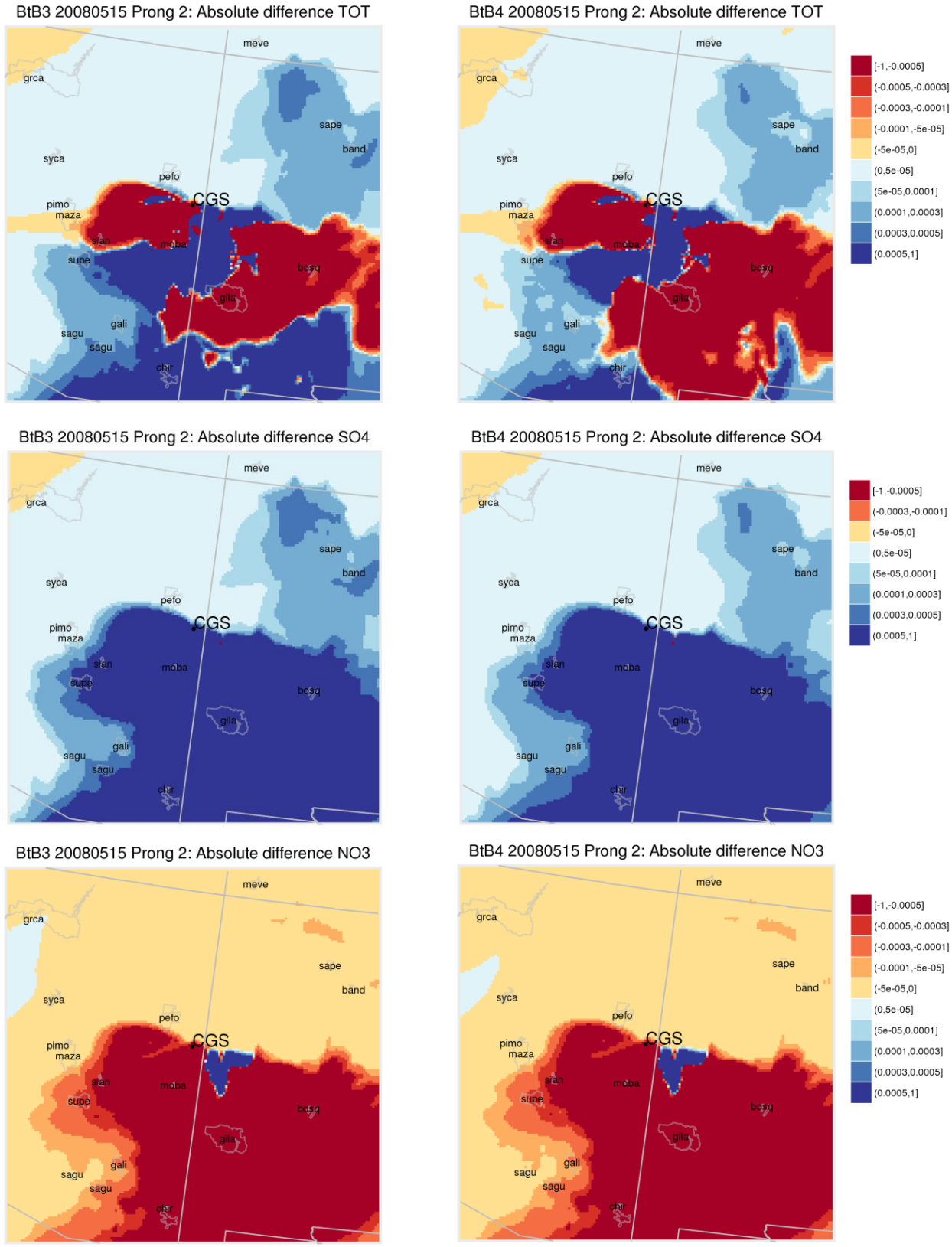


Figure 15. "Prong 2" for single day and by pollutant: BTB3 and BTB4. May 15.



Conclusions

Individual day CAMx modeling results for total delta deciviews and delta deciviews based on CGS sulfate and nitrate concentrations alone, show CGS impacts above 0.025 dv for all cases at some location throughout the domain. In addition, higher delta deciview values are generally observed closest to the CGS source and the spatial pattern of delta deciviews is of a dispersed plume. There is no pixelated pattern indicative of numerical "noise" in these plots. Likewise, the "Prong 1" and "Prong 2" plots show delta deciview differences that may be above 0.0005 dv and below -0.0005 dv over wide regions of the modeling domain along with generally smooth transitions in delta deciview differences across the domain. The "Prong 1" BTB1 case for May 15 (Figure 1) compares scenarios with identical emissions (Baseline and BTB1) and therefore the reported differences are essentially zero, in these plots some pixilation occurs at values of ± 0.0000005 dv, which is an indication of numerical "noise". This is one to two orders of magnitude lower than the smallest result from the CGS two-prong BTB test.

In summary, the CAMx modeling results for the BTB test are valid numerical results, the differences between the scenarios (i.e. the "Prong 1" and "Prong 2" on individual days) are small (~ ±0.0005 dv) but are not artifacts of numerical "noise" but represent valid modeled responses to different CGS emissions scenarios.

References

EPA Comment*:*

We recommend including certain additional plots of photochemical modeling results. We appreciate your efforts in addressing the majority of our concerns regarding the Better-than-BART (BtB) photochemical modeling. The account by Environ' includes several spatial plots aimed at addressing the issue of whether the small differences between modeled scenarios represent actual visibility benefits, as opposed to numerical "noise." However, because these plots (Figs. 4-9 through 4-16, for BtB scenarios 1 -4, both Prong 1 and Prong 2) appear to be of annual averages, they would necessarily smooth over any numerical artifacts that are of concern in the "noise" issue. We recommend that additional plots be prepared for nitrate differences and for sulfate differences. The plots would be of daily averages on individual days, for the subset of days for which CGS has a contribution at the most affected nearby Class I areas. Such plots would be more useful in discerning whether differences used in the Prong l and Prong 2 visibility metrics behave as expected.

Report 2016, Revised Better-than-BART Analysis for the Coronado Generating Station using the CAMx Photochemical Grid Model, June 2016 Ramboll ENVIRON