Southeastern State

Air Resource Managers

Air Quality Modeling for $PM_{2.5}$, Haze, and Ozone

VISTAS- SESARM

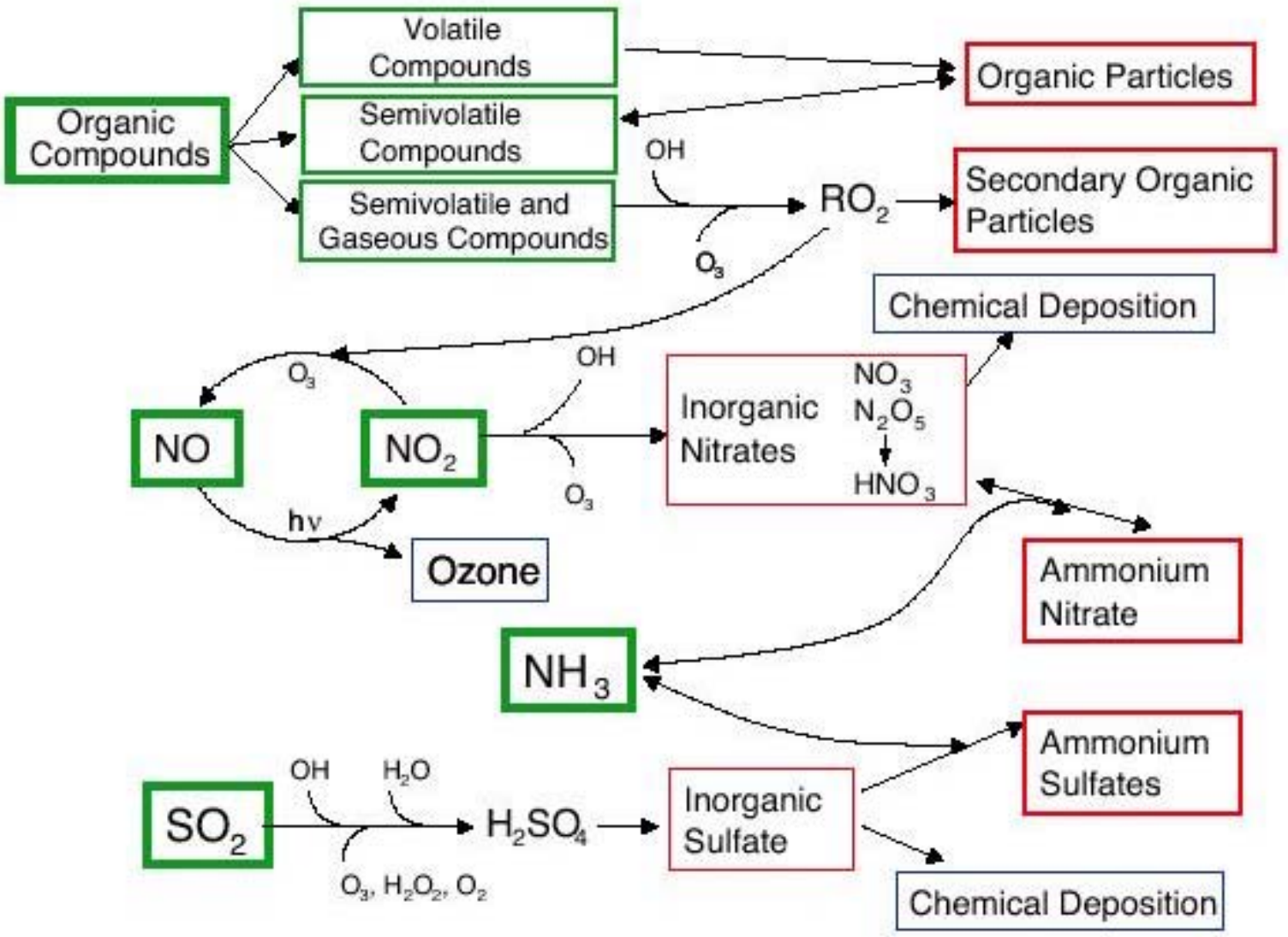
MARAMA meeting

February 11, 2009

Planning for Next SIPs

- One-Atmosphere approach to air quality modeling and regulatory demonstrations
  - Daily $PM_{2.5}$ SIPs due spring 2012
  - Revised 8-hr ozone SIPs due summer 2013
  - Regional haze progress demonstration due Dec 2012
- Use one modeling platform for all three issues even if need to model more than one year to address all requirements

One Atmospheric Approach to Air Quality Management



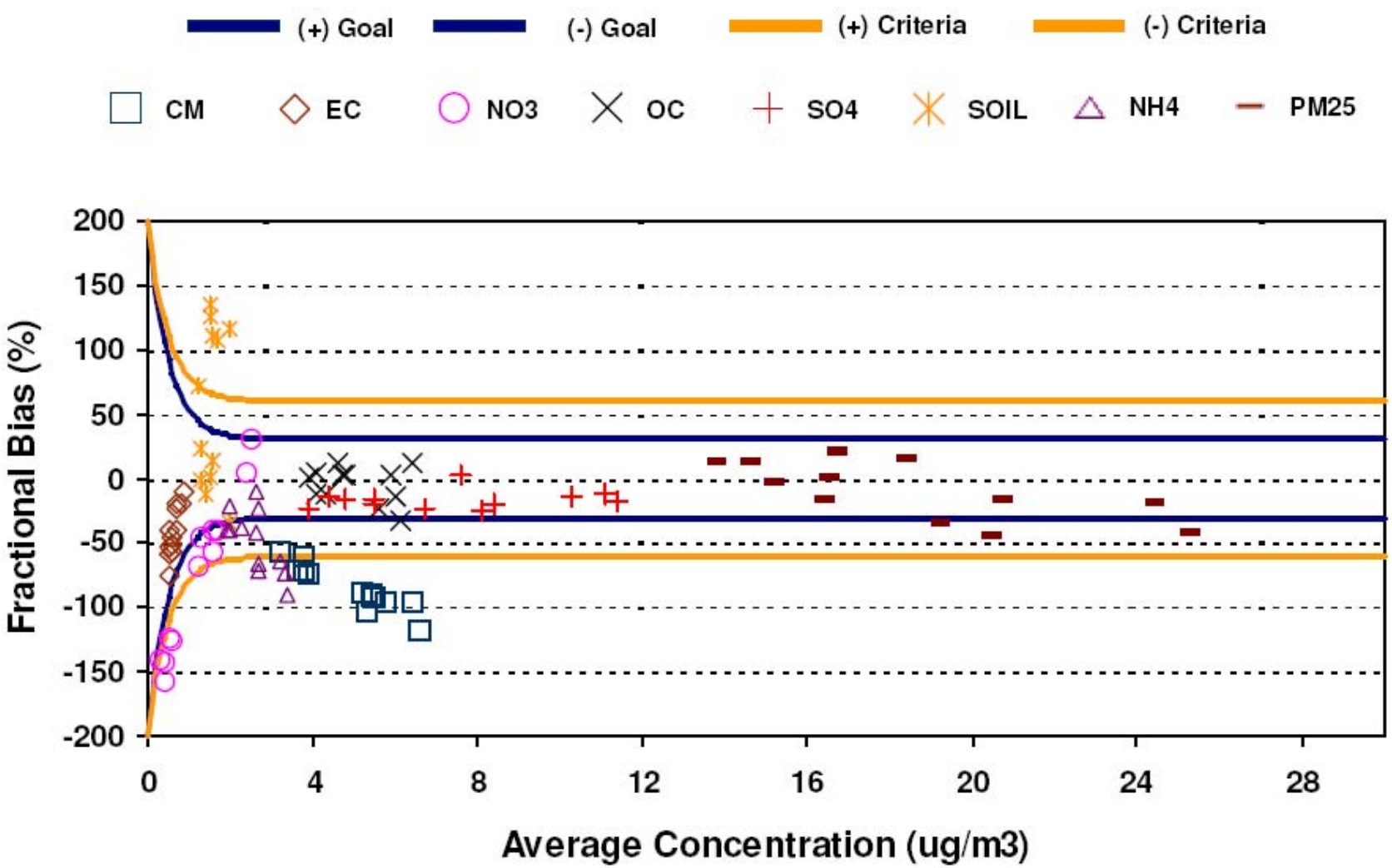
Source: Particulate Matter Science for Policy Makers – A NARSTO Assessment, 2003.

Modeling Lessons Learned

- Need good meteorological performance to get good air quality performance
  - Use as fine grid resolution as can afford
  - Focus on wind speed, boundary layer, moisture
  - May need more than one regional configuration
- CMAQ and CAMx air quality model performance
  - Generally acceptable for SO_4, NH_4, EC, ozone
  - Need improvements for NO_3, OC, soil
    - Improve inventories
    - Improve model treatment of SOA formation
  - Except soil, models generally under predict $PM_{2.5}$ and components

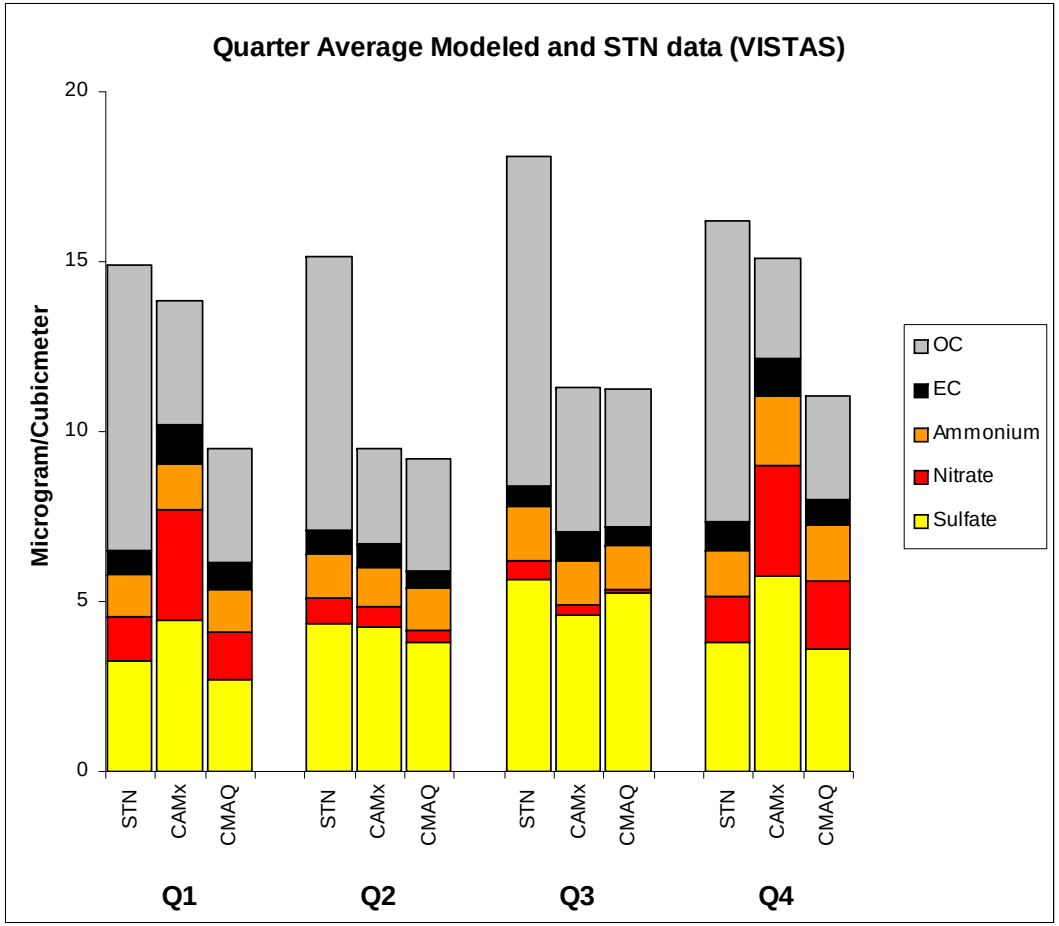
VISTAS CMAQ 2002 Actual Base G2 12k

IMPROVE



CMAQ and CAMx Model Performance Across All Sites in VISTAS Region

2002 CAMx & CMAQ



Modeling Lessons Learned

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- Boundary conditions are important
  - Re-circulation of continental emissions over Atlantic and back into modeling domain
  - May need to extend eastern modeling domain further east for accurate source apportionment

Daily PM2.5 Standard

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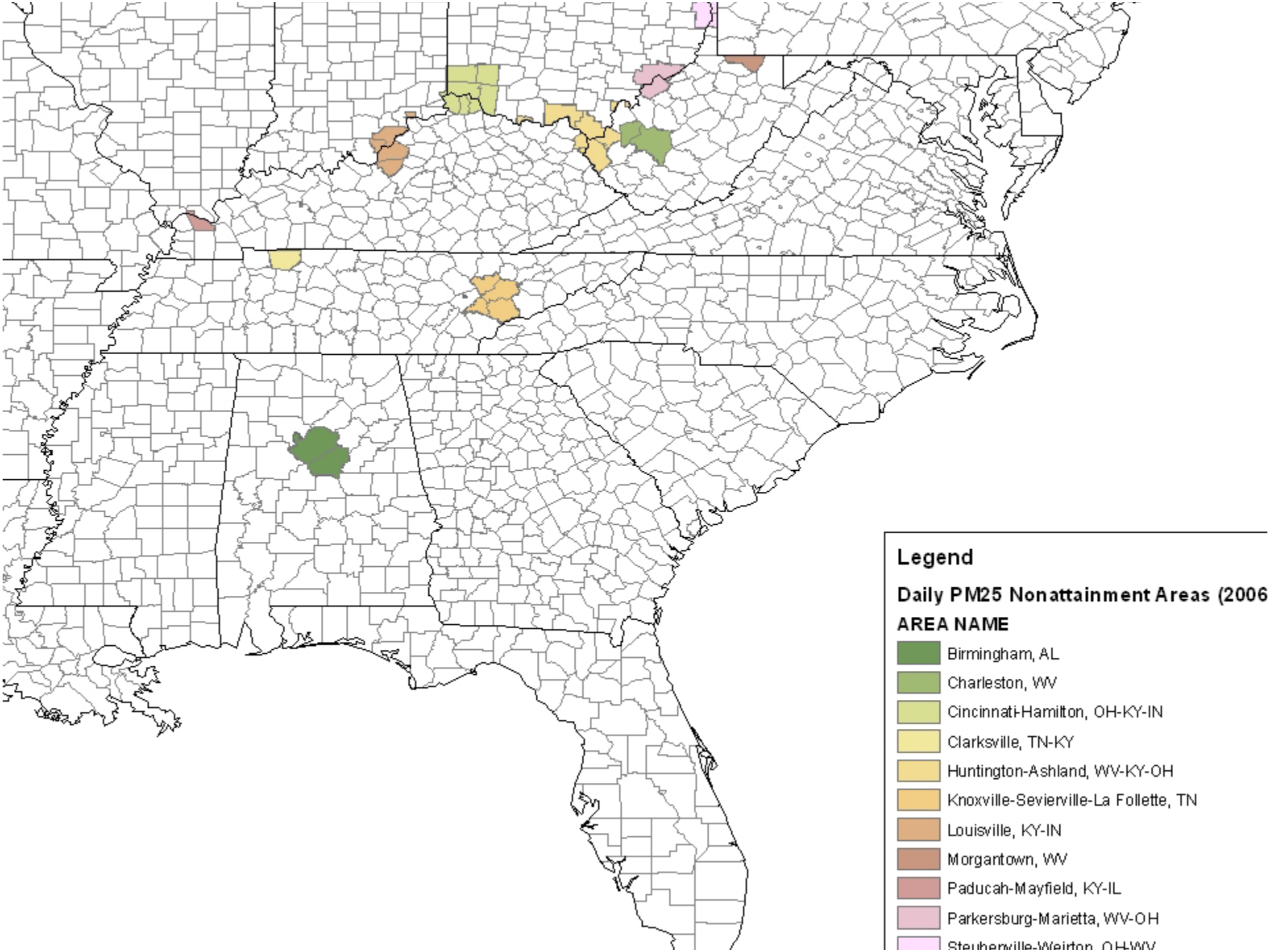
- EPA designated non-attainment areas
  - Based on 2005-2007 $PM_{2.5}$ values
  - Some areas already demonstrating attainment, other areas same as annual $PM_{2.5}$ non-attainment
- Attainment plans due in spring 2012, demonstrate attainment by 2014
  - Attainment modeling needs to be completed spring 2011 to allow SIP development
  - Suggests 2005 as initial base year; 2012 or 2013 as initial projection year
- In particular need to understand role of fire and exceptional events

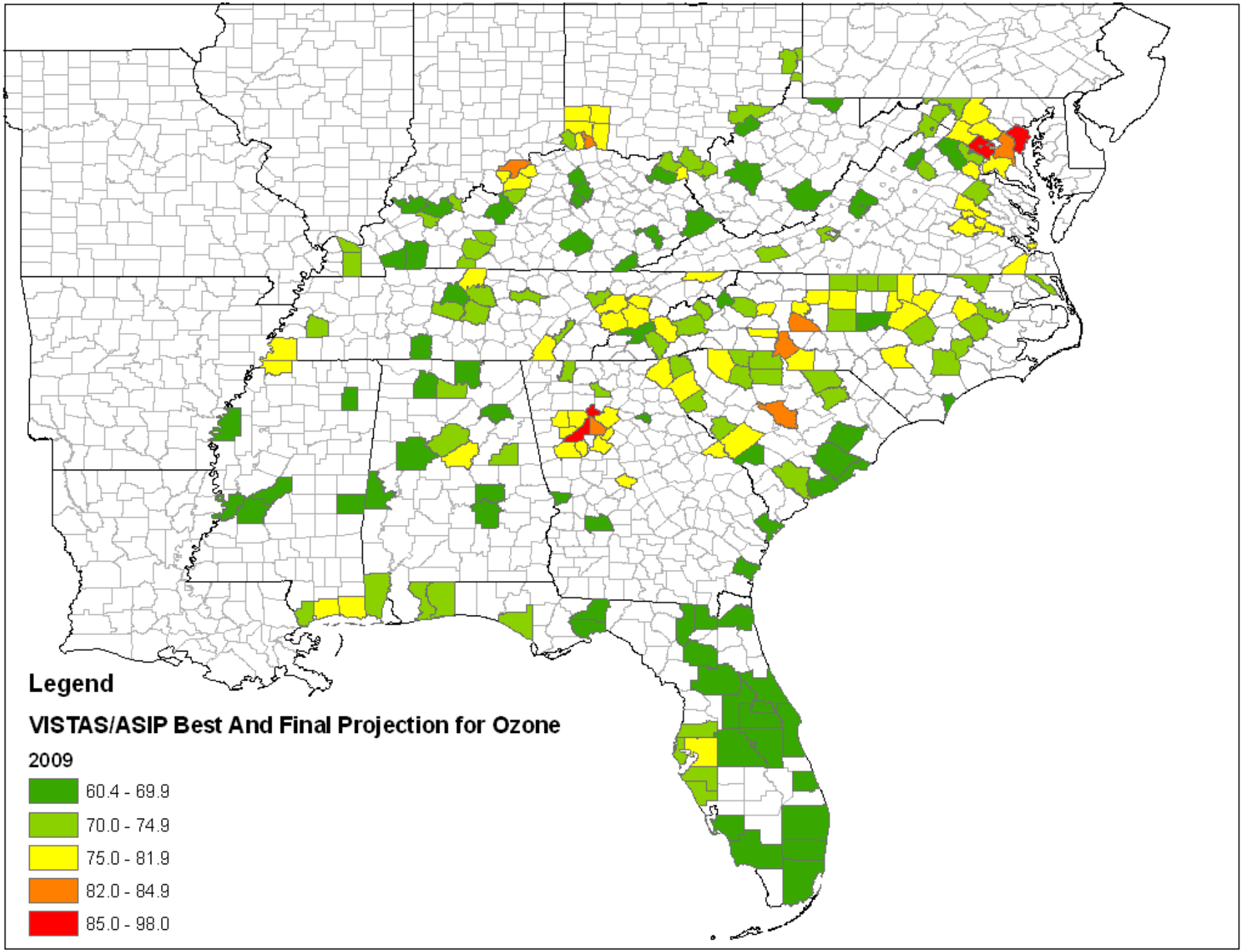

Legend
Daily PM25 Nonattainment Areas (2006
AREA NAME
Birmingham, AL
Charleston, WV
Cincinnati-Hamilton, OH-KY-IN
Clarksville, TN-KY
Huntington-Ashland, WV-KY-OH
Knoxville-Sevierville-La Follette, TN
Louisville, KY-IN
Morgantown, WV
Paducah-Mayfield, KY-IL
Parkersburg-Marietta, WV-OH

Revised Ozone Standard

- EPA promulgated Mar 2008
- States to recommend non-attainment areas for revised ozone standard (0.075 ppm) in spring 2009, based on 2006-2008 data
- EPA to designate based on 2007-2009 data
- Demonstrate attainment in 3 years (2013) for marginal areas, 6 years (2016) for moderate areas, 9 years for serious areas
  - Suggests 2008 as base year, 2012 or 2013 as one demonstration year
  - NC and VA need to evaluate implications of 2008 fires

Ozone Modeling

- Best and Final modeling assumes CAIR is implemented
- 1997 ozone standard (0.08 ppm)
  - All areas attain by 2009, except Atlanta, GA and northern VA, which attain by 2012
- 2008 ozone standard (0.075 ppm)
  - In 2009, 32 non-attaining monitors
  - In 2012, 23 non-attaining ozone monitors


Legend
VISTAS/ASIP Best And Final Projection for Ozone
2009
60.4 - 69.9
70.0 - 74.9
75.0 - 81.9
82.0 - 84.9
85.0 - 98.0

2012 Regional Haze Demonstration

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- 2012 reasonable progress demonstration will focus on monitoring trends and emissions inventory data
  - Are actual emissions consistent with projected emissions reductions (especially for CAIR)?
  - Are we on track to meet reasonable progress goals in 2018?
  - Air quality modeling results for daily PM2.5 will also benefit reasonable progress demonstration
- Consult with FLM/EPA early and often

Planning for Next SIPs

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- Meteorological Model
  - MM5 no longer supported
  - States are migrating to WRF
  - States will begin modeling spring-summer 2009
- Emissions model
  - CONCEPT is conceptually more transparent model than SMOKE but better documentation needed for new users
  - States expect to continue to use SMOKE

Planning for Next SIPs

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- Air Quality Model
  - CMAQ is EPA-supported, community add-ons
  - CAMx was developed by ENVIRON but other firms, states are running CAMx
  - CMAQ and CAMx have comparable model performance
  - Both CMAQ and CAMx have source apportionment tools
    - CAMx-PSAT most widely demonstrated to date
  - States currently have more experience running CMAQ but open to use either or both models for next SIPs – decision in 2009

Planning for Next SIPs

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- VISTAS states will assume in-house regional modeling responsibilities for next SIPs
  - VISTAS to release request for proposals for met, em, and air quality modeling this spring 2009
  - Intend contractor to help define model base year configurations based on model performance
  - Transfer base year model run to states to benchmark and operate
  - States in lead modeling role with contractor support
    - GA and NC will have lead responsibilities
    - VA capabilities split between OTC and VISTAS
    - SC developing capabilities

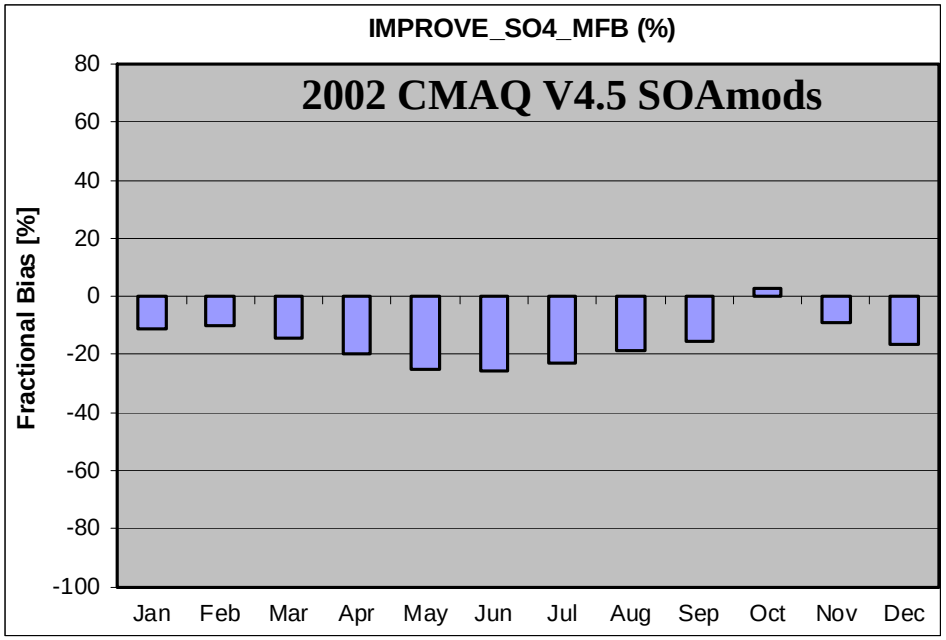
Planning for Next SIPs

- State Collaborative modeling
  - Advantages: common modeling platform, common assumptions
  - Disadvantages: 36 km domain, LADCO inventory assumptions, not as good model performance as VISTAS modeling
- VISTAS states expect to continue to participate in State Collaborative modeling and to conduct southeastern regional modeling

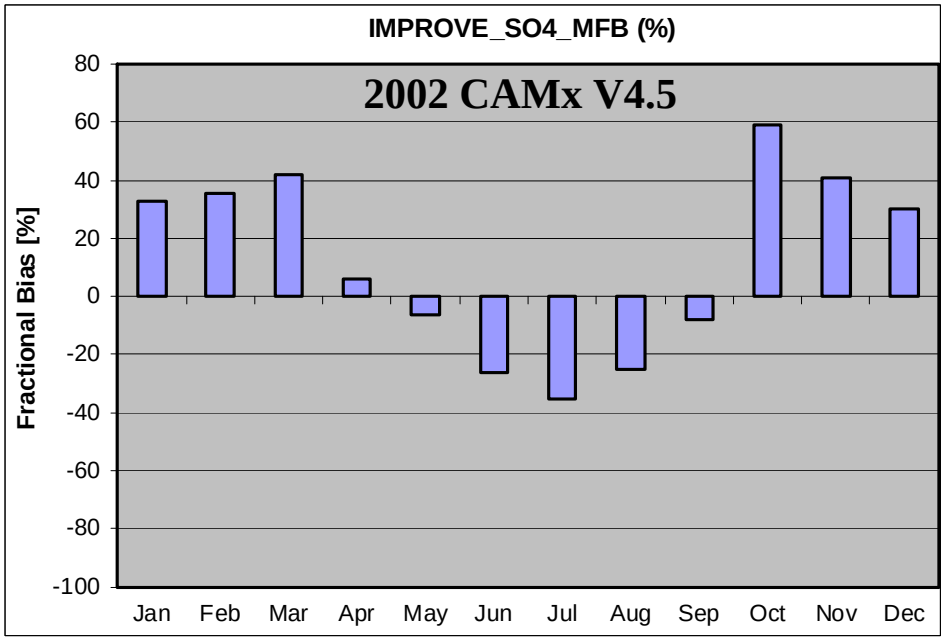
Planning for Next SIPs

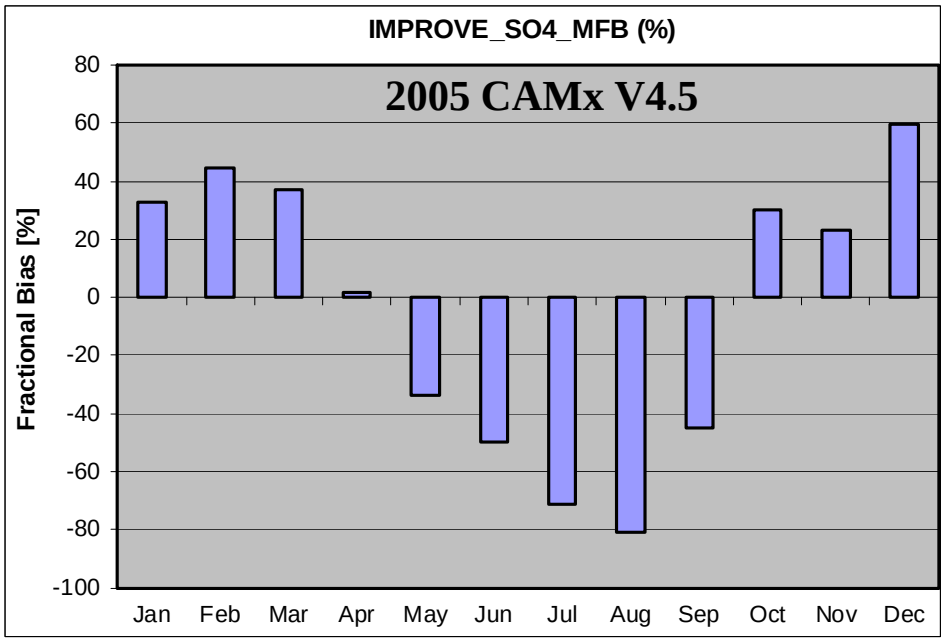
- Modeling decisions
  - Modeling Domain
    - Expand eastern border of 36-km national grid?
    - 12-km southeastern regional grid
      - States may need 4-km grid for specific non-attainment areas
  - Modeling Platform: WRF, SMOKE, CMAQ/CAMx
  - During 2009 GA and NC intend to conduct initial WRF meteorological model performance evaluation for 2005 and 2008 with contractor support

Model Performance: VISTAS IMPROVE Network: SO_4

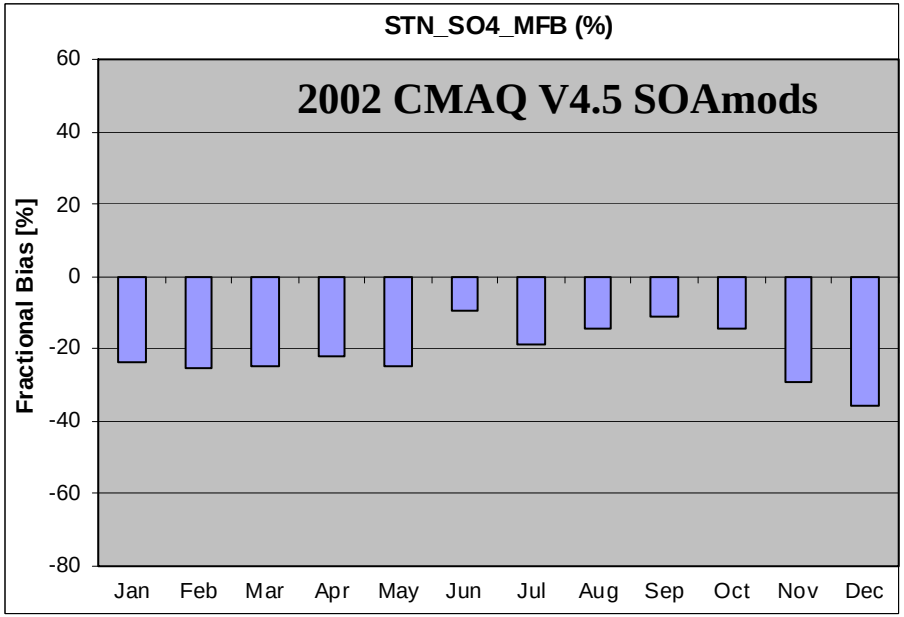


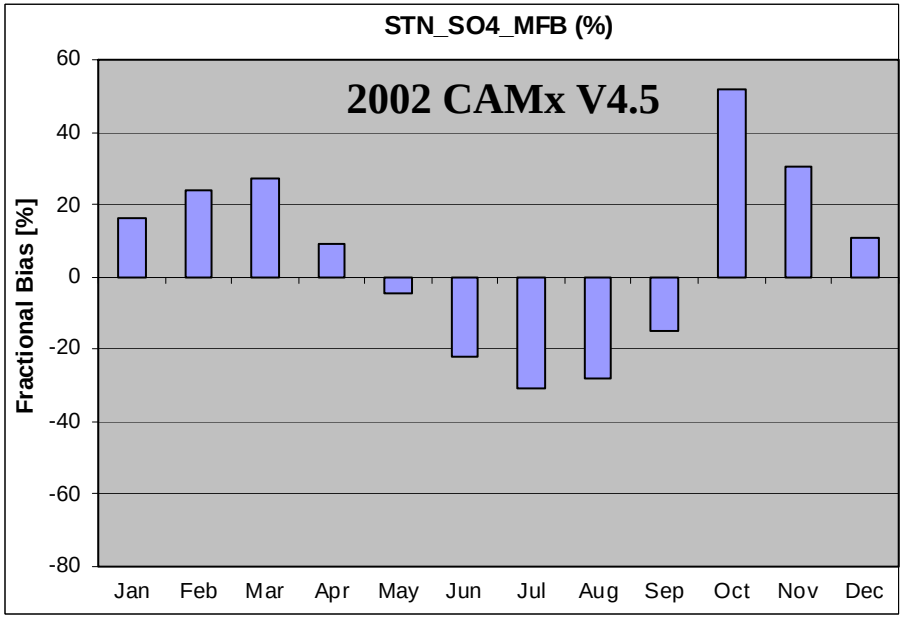
The “Good”

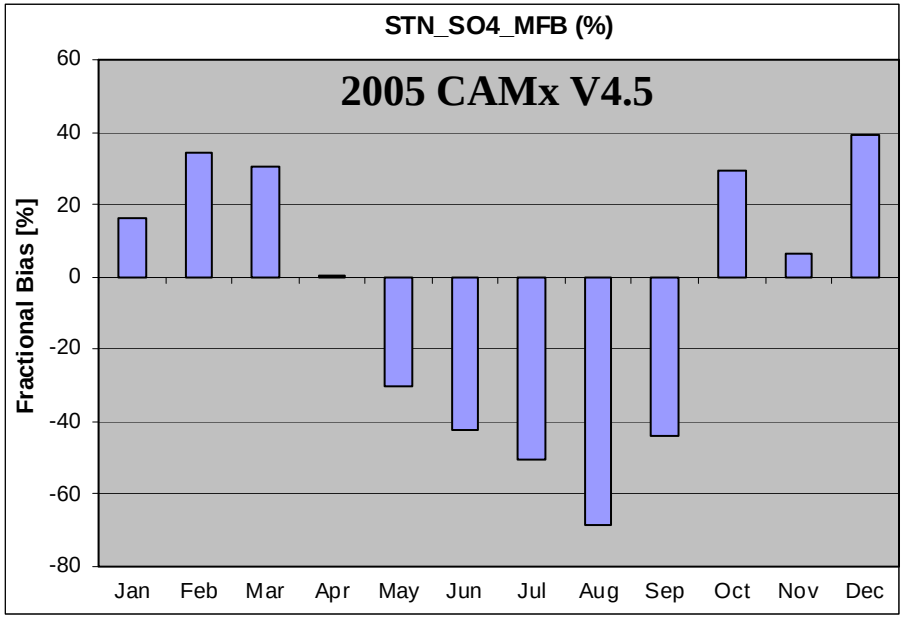




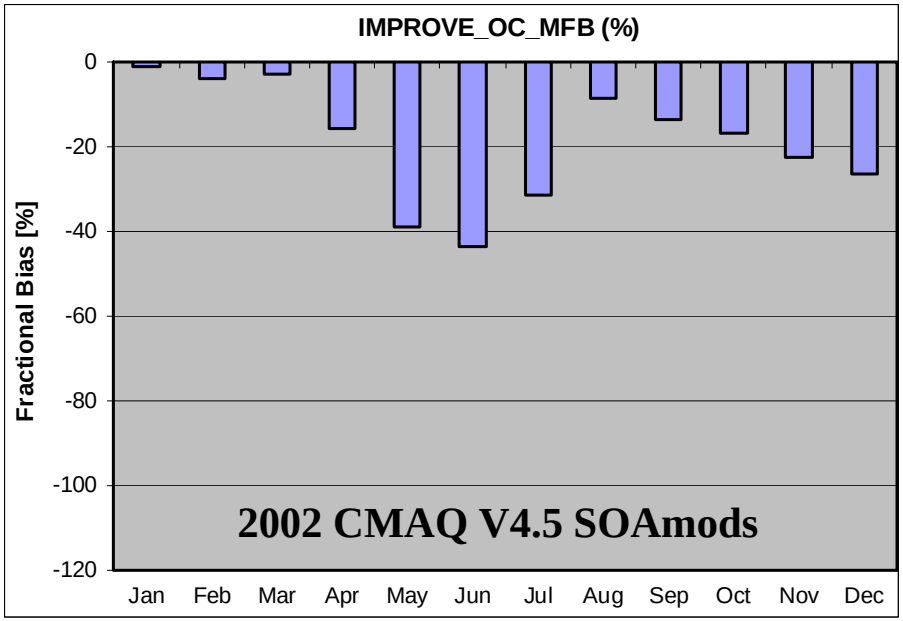
Model Performance: VISTAS STN Network: SO_4



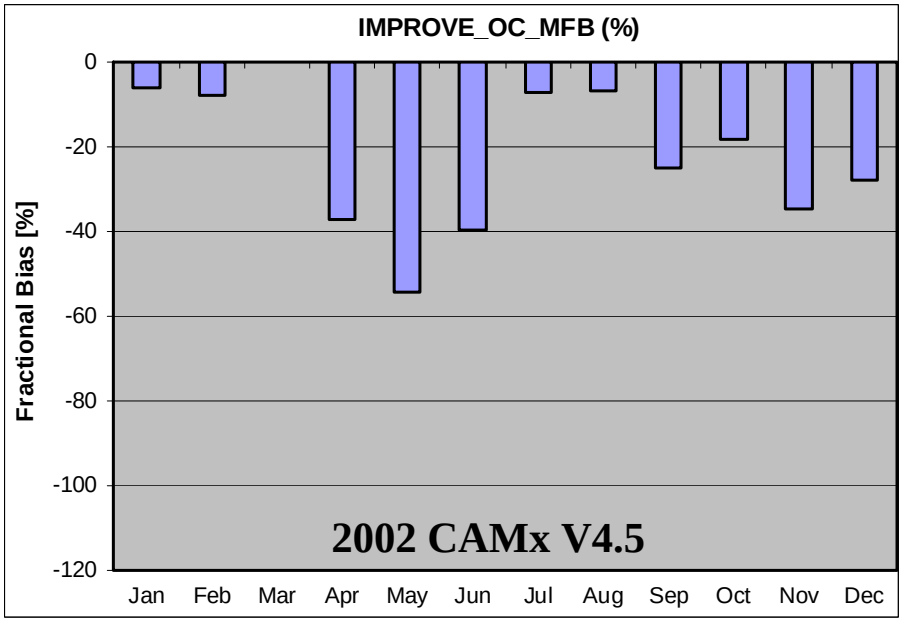


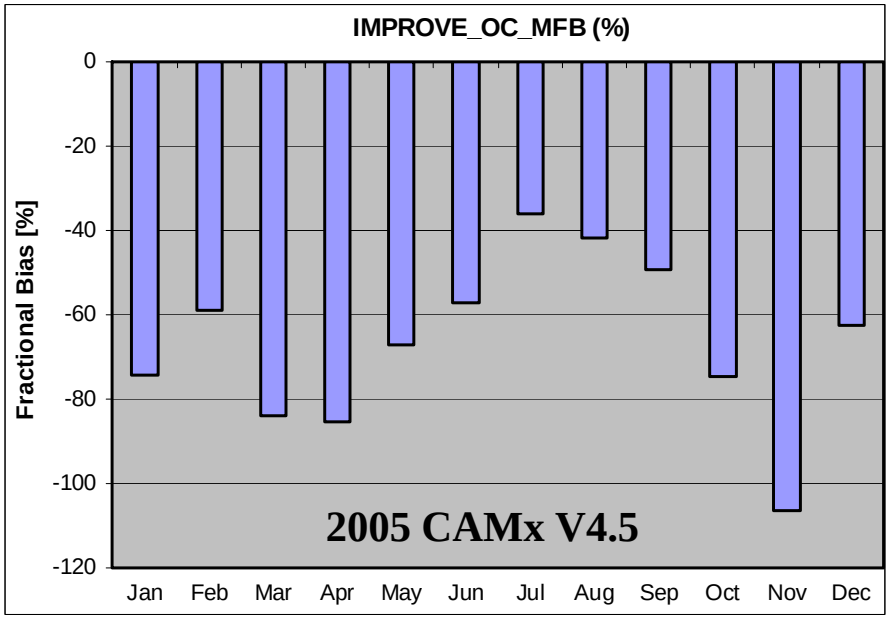


Model Performance: VISTAS IMPROVE Network: OC

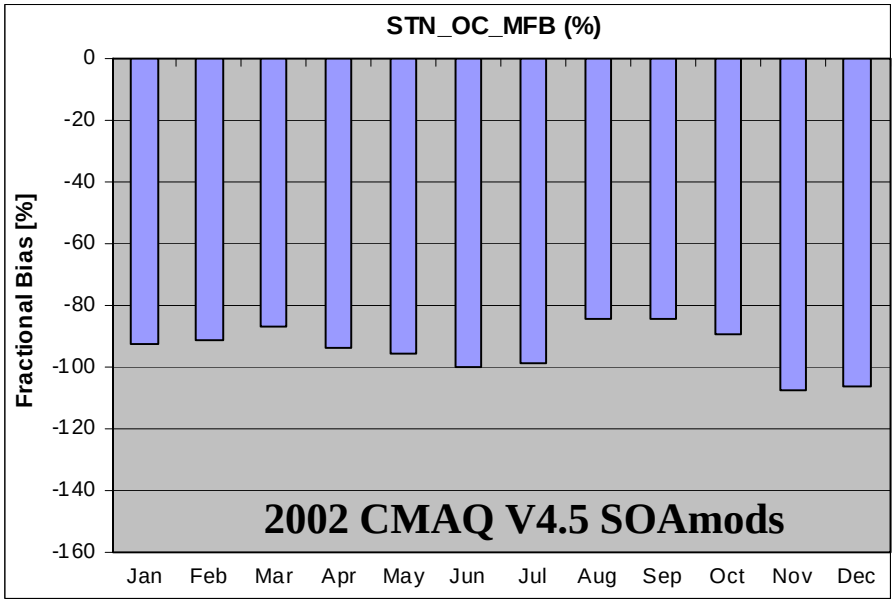


The “Bad”





Model Performance: VISTAS STN Network: OC



The "Ugly"