The National Emissions Collaborative

A Cooperative Approach to Developing Emissions Modeling Platforms

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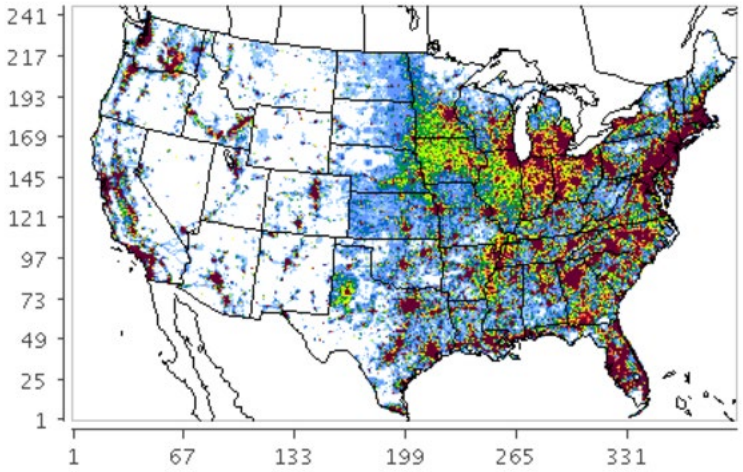
What's an EMP?

Emissions Data

Modeling Software

Documentation

Emissions Modeling Platform



CMAQ or CAMx

History of EMPs

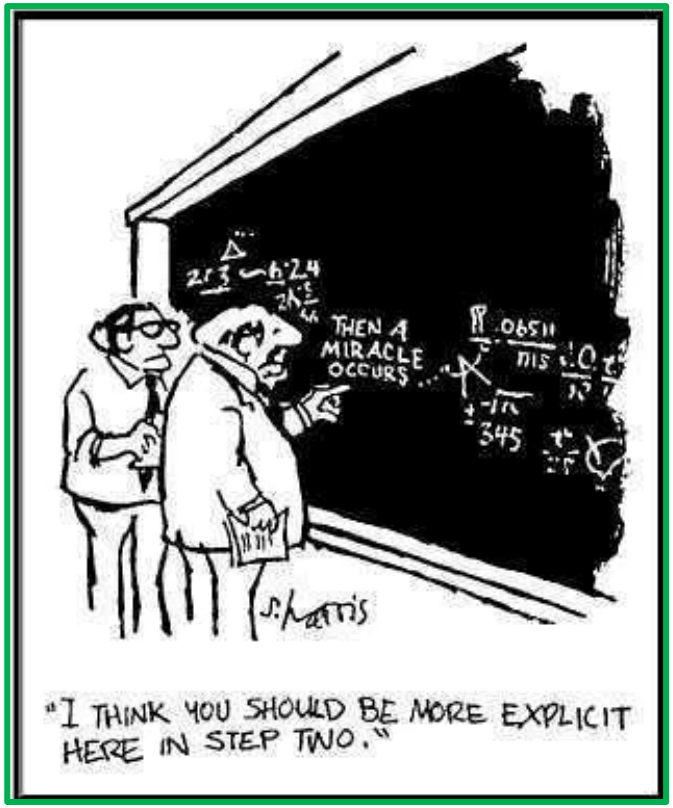
- U.S. EPA OAQPS Emissions Inventory and Analysis Group
- EMPs were a way to package and distribute emissions data used for analyses and rulemaking
- Originated with 2002 NEI and evolved through the 2011 NEI
- Regional → national paradigm shift

Features of an EMP

- Comprehensive
- Complex
- Sizeable
- Well Documented
- Functional
- Extensible

Motivation for the Collaborative

- Demand for a new, national multi-purpose EMP
  - State Implementation Plans, federal analyses
  - 2011-based inventories had been used for 5+ years
- States and regions requested more involvement in the development of national EMPs
  - Triennial NEIs (and annual point inventory data) to EPA
  - EPA processes/packages these data into modeling platforms
  - **How does that process work? Can it be more collaborative?**

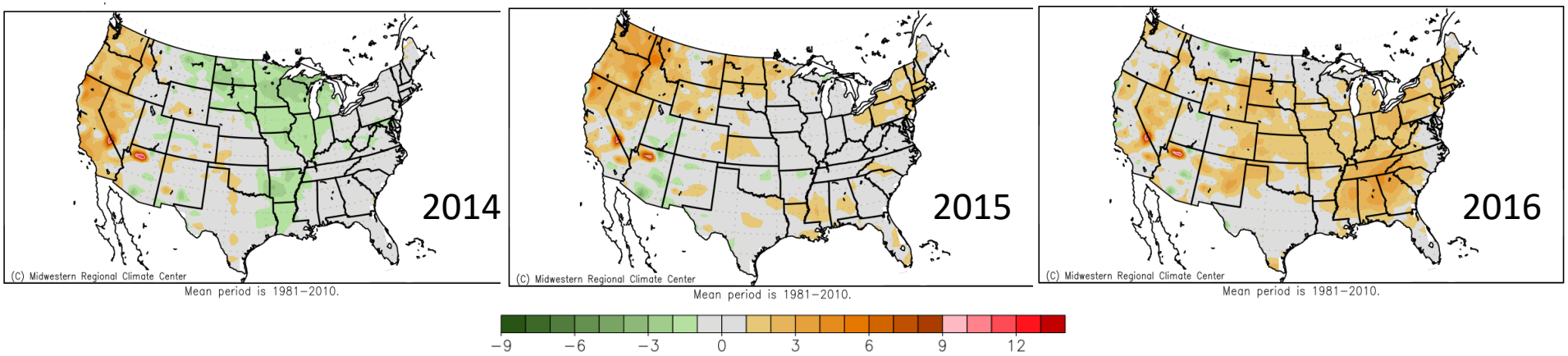


Credit: Sidney Harris

Why 2016?

- State/Regional/EPA Workgroup convened in spring 2017 to pick new national base year for O_3, $PM_{2.5}$, and haze modeling
  - Focus on SIP modeling
  - Constrained by timing: selected from 2014-2016
- Considered met representativeness, emissions data availability and exceptional events
- Concluded 2015 and 2016 should be modeled…but to use 2016 if only one year could be selected

Average Max Temperature Departure from 30-year Mean (Apr – Sep)



Collaborative Organization

- Membership
  - **Coordination co-leads**: Zac Adelman (LADCO) and Alison Eyth (EPA OAQPS)
  - **Coordination committee**: MJO directors, state and EPA staff
  - **Sector-specific Workgroups**: co-led by one regional/state staff and one EPA staff (where possible)
- Workgroups
  - 245 federal, regional, state/local/tribal agency staff

Electricity Generating Unit Point
Non-EGU Point
Onroad Mobile
Nonroad Mobile
Commercial Marine
Rail
Area/Nonpoint
Oil and Gas
Fires
Biogenic
Canada & Mexico
Modeling
Coordination

Collaborative Process

- Initiated by a regional (MJO) and EPA Coordination Committee in fall 2017
- Zac Adelman and Alison Eyth volunteered as the co-leads of the Collaborative
  - Developed a workplan, communication and data sharing infrastructure, identified workgroups and recruited co-leads
- Iterated on the workplan and process with the Coordination Committee
- Workgroups convened starting at the end of 2017
  - Worked throughout the process to collect, develop, and analyze inventory and ancillary emissions data
- Communication, communication, communication!!!

Collaborative → EMP Process

- At the end of the Collaborative data development cycle, EPA served in the role as integrator
  - EPA put significant resources into running models, collating, packaging, and testing the Collaborative emissions data
- Consensus decision in the Collaborative to have EPA OAQPS package the data into an EMP for distribution
  - Desire to leverage EPA experience and resources in this effort
  - Allowed the Collaborative to focus on analysis of data and process

Collaborative Communication

- Monthly Steering Committee Calls
- Monthly Sector Workgroup Calls
- Quarterly National Report-Out Webinars
- Wiki for call notes and workgroup documentation
- Cloud-based file sharing
- Continual requests for feedback into the process from air planning agencies
- Multiple opportunities for Q&A with stakeholders

Collaborative Deliverables

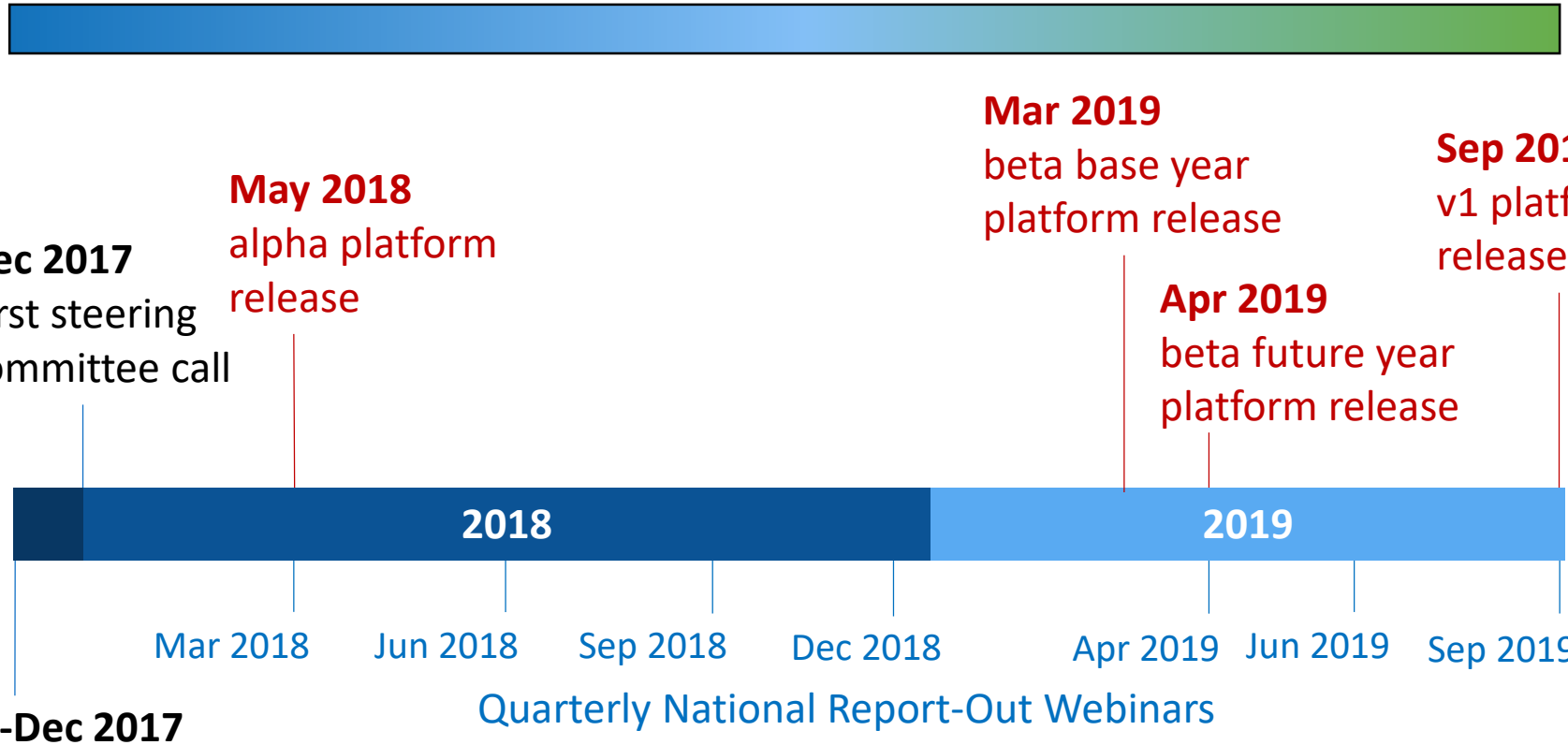
Several versions of the 2016 platform were developed

- **Alpha**: *preliminary* version based on US EPA 2014 National Emissions Inventory for some and 2016 for other key sectors (released by EPA Spring, 2018)

- **Beta**: *improved and/or new* version of actual 2016 emissions for most sectors (March 2019) and preliminary projected emissions for 2023 and 2028 (to workgroups in April 2019)

- **V1.0**: *fully updated* 2016 emissions and complete projected emissions for 2023 and 2028 (Summer/Fall 2019)

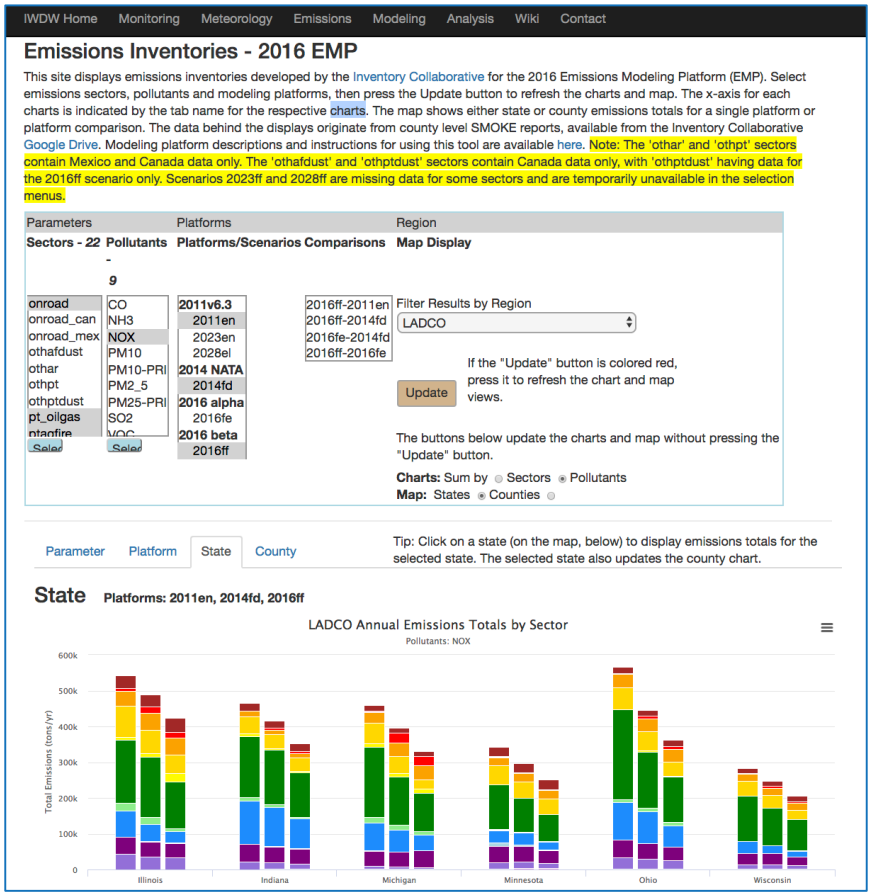
Collaborative Timeline



Oct-Dec 2017
MJOs, EPA, and states initiate the collaborative, recruitment of WG co-leads, infrastructure development

2016 Platform Data Access

- Intermountain West Data Warehouse (IWDW)
  - Download the complete emissions modeling platform
  - Modular downloads of the entire air quality (CAMx and CMAQ) platform
  - Interactive analysis tools
- LADCO Data Viewer
  - Archive of static summary plots



Key Principals of Collaborative EMP Development

- A **superordinate goal** is needed to motivate the community
  - State/regional participation in SIP emissions development
- **Workplan** with clear process and expectations
- Committed and available workgroup **leadership**
- Organized and **open communication** structures
  - Regular calls with internal and external stakeholders
  - Documentation and file templates/examples
  - Ample opportunity for stakeholder feedback/input
- Collaborative **information sharing** tools
  - Wiki for workgroup notes and meeting minutes
  - Cloud storage (G-Drive) for file sharing

Lessons Learned

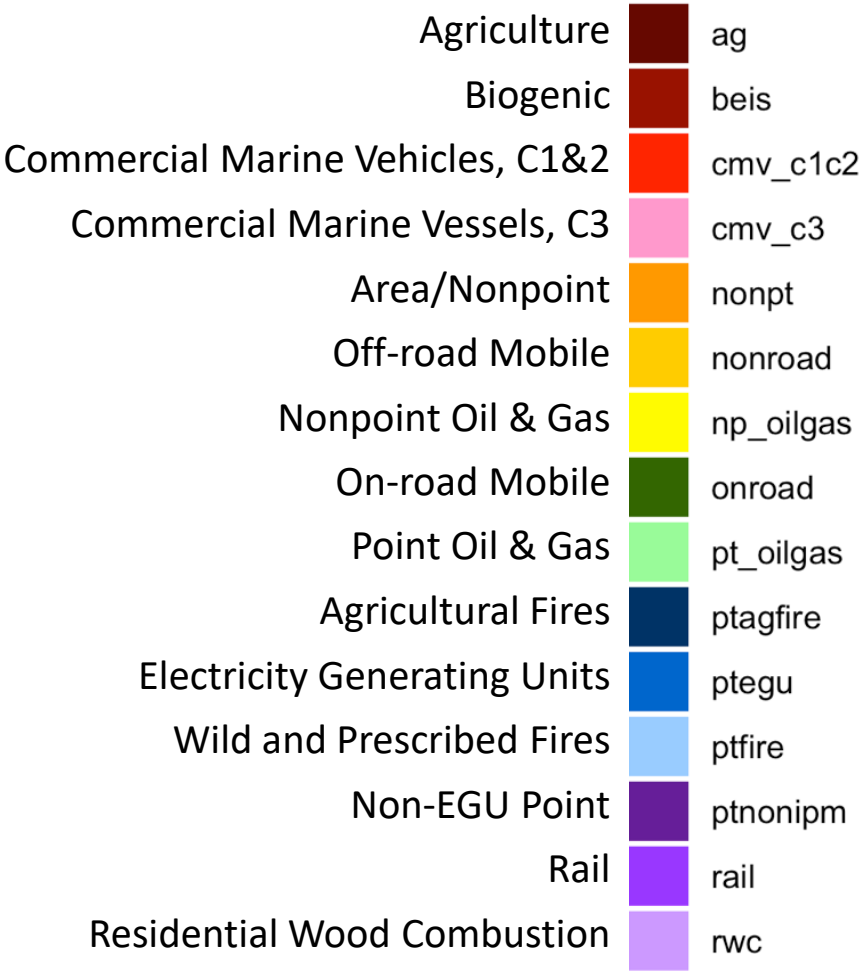
- Better **understanding** across the country of the amount of effort required to take the NEI and turn it into a national EMP
  - The community was able to contribute to the data and methods used to construct the platform
- New paradigms/disruptions run up against **practical concerns** (e.g., SIP timelines)
- EPA's **legal obligations** regarding data distribution and communication did not align with the nature of the collaborative process; primarily for emissions projections
- **Sum of Parts > Whole**: There is a lot of talent in the state planning agency emissions community that needs to be leveraged for evolving the state of the art
  - Need to be more deliberate in engaging other members of the emissions community: academia, industry, consulting

Next Steps

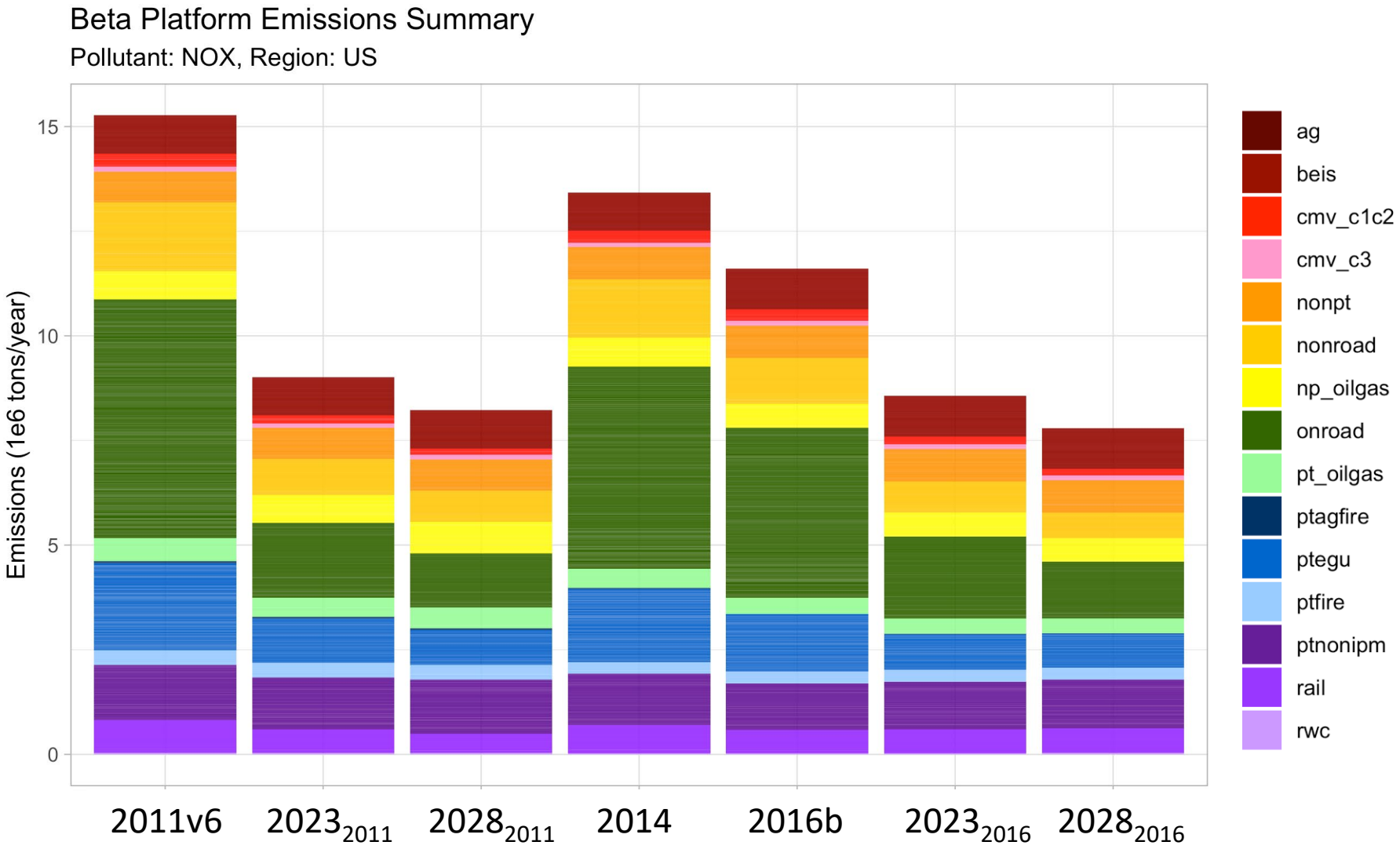
- Version 1 will be released ~ September 2019
- Air quality modeling and evaluation will commence with the 2016v1 platform
- SIPs (ozone and regional haze) and research projects will use the 2016v1 platform
- Discussions are ongoing in the Collaborative leadership about what happens post-v1
  - How will the process evolve as the 2016 platform evolves?
  - What's the ongoing commitment of the Collaborative participants?
  - Will we do this again for another national modeling platform? Or some variation of the Collaborative?
- And now for a preview of the results…

2016beta Emissions Summaries

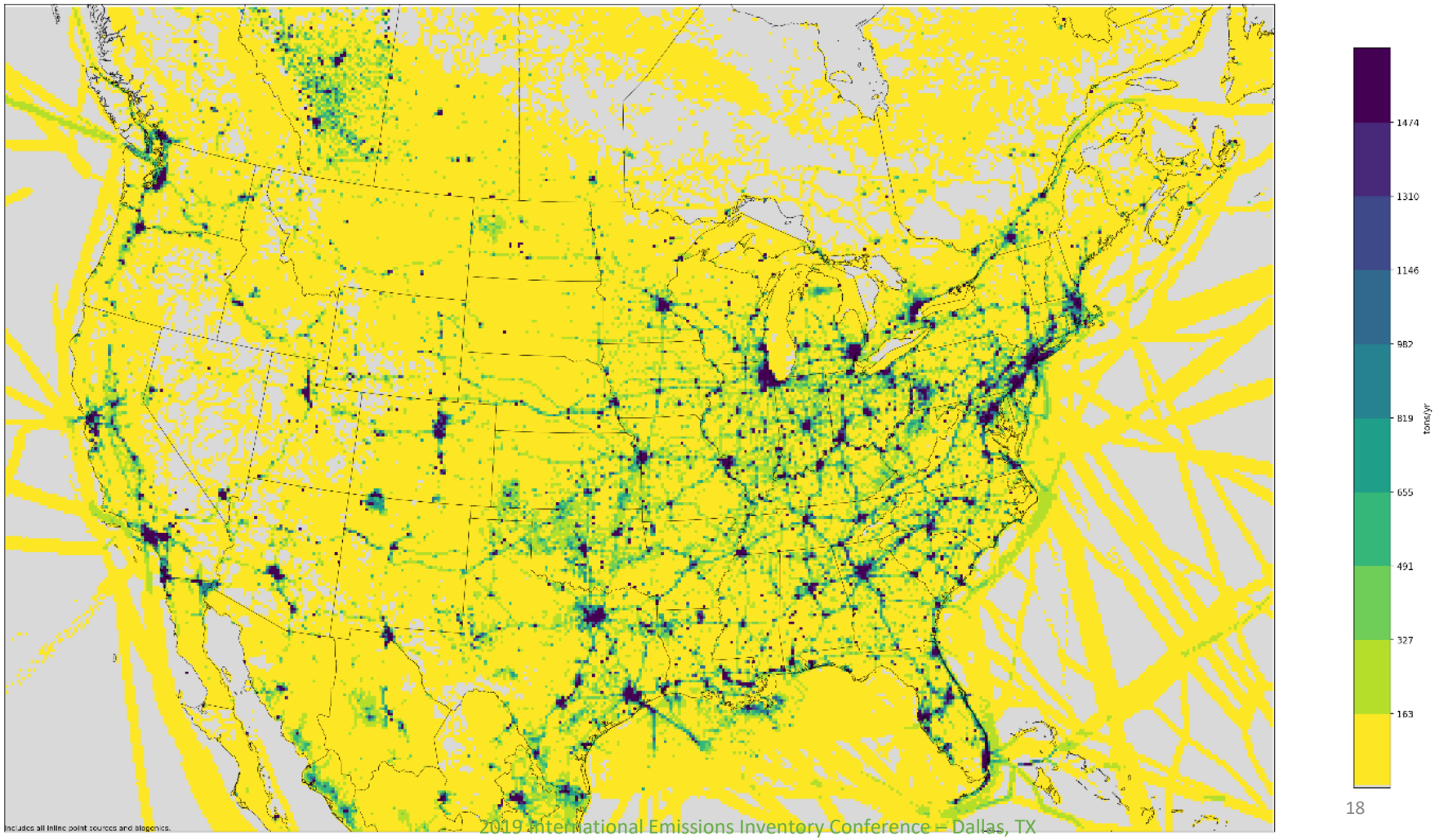
- Annual totals mask temporal variability in the data
- Comparisons across recent inventory base years (2011, 2014, 2016)
- Summaries of key "Criteria" pollutants: NOx, VOC (O_3 precursors); $PM_{2.5}$, SO_2, NH_3 (PM & haze precursors)
- More results are available from the IWDW and LADCO websites



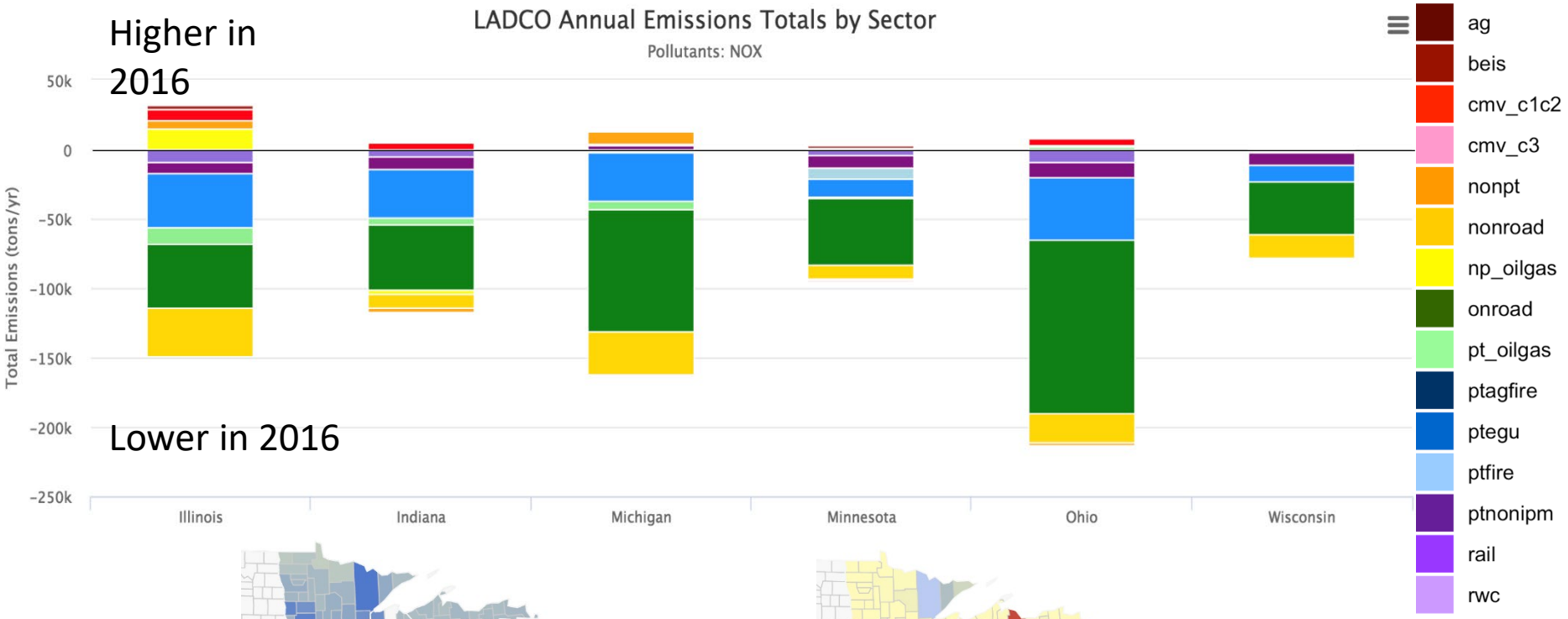
National NOx Emissions by Sector

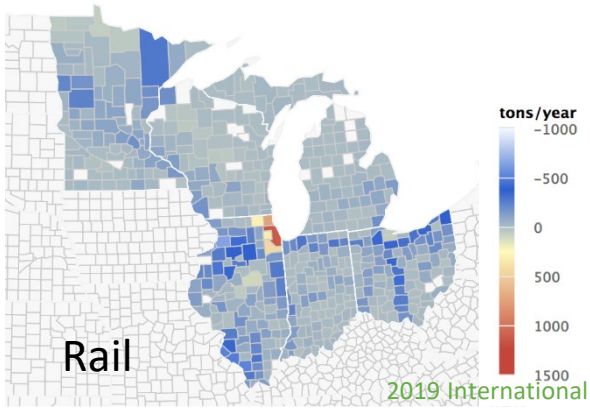


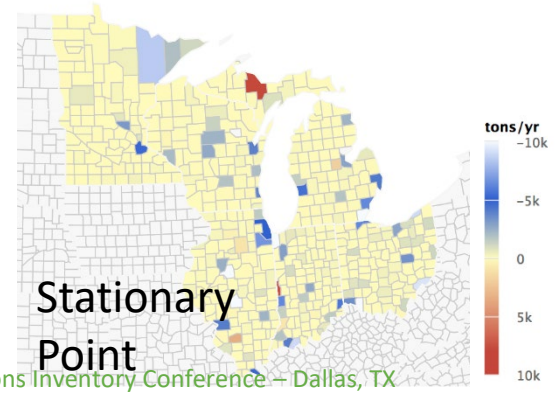
2016 Annual 12-km Gridded NOx Emissions (tons/year)



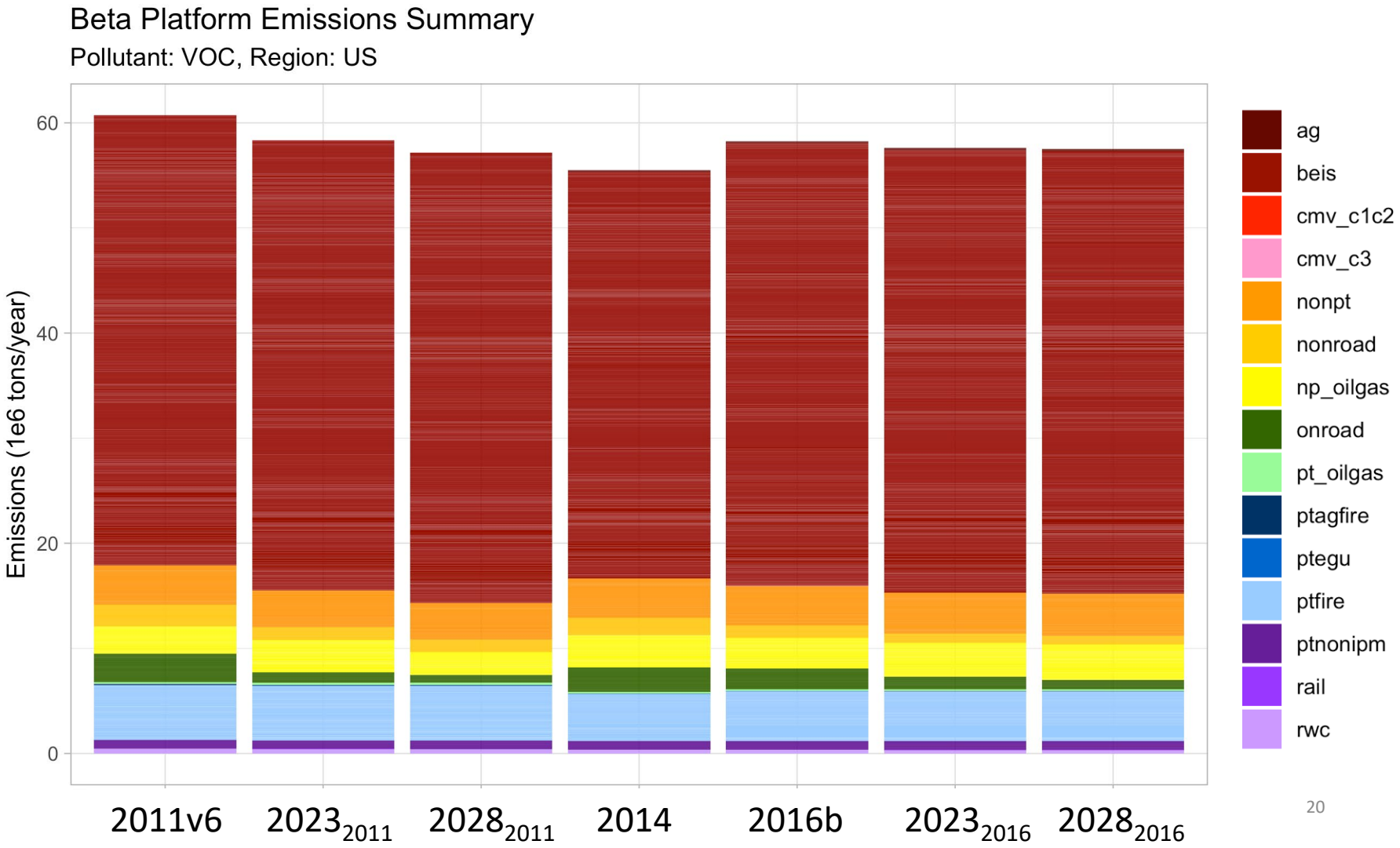
2016-2011 State Total NOx Emissions



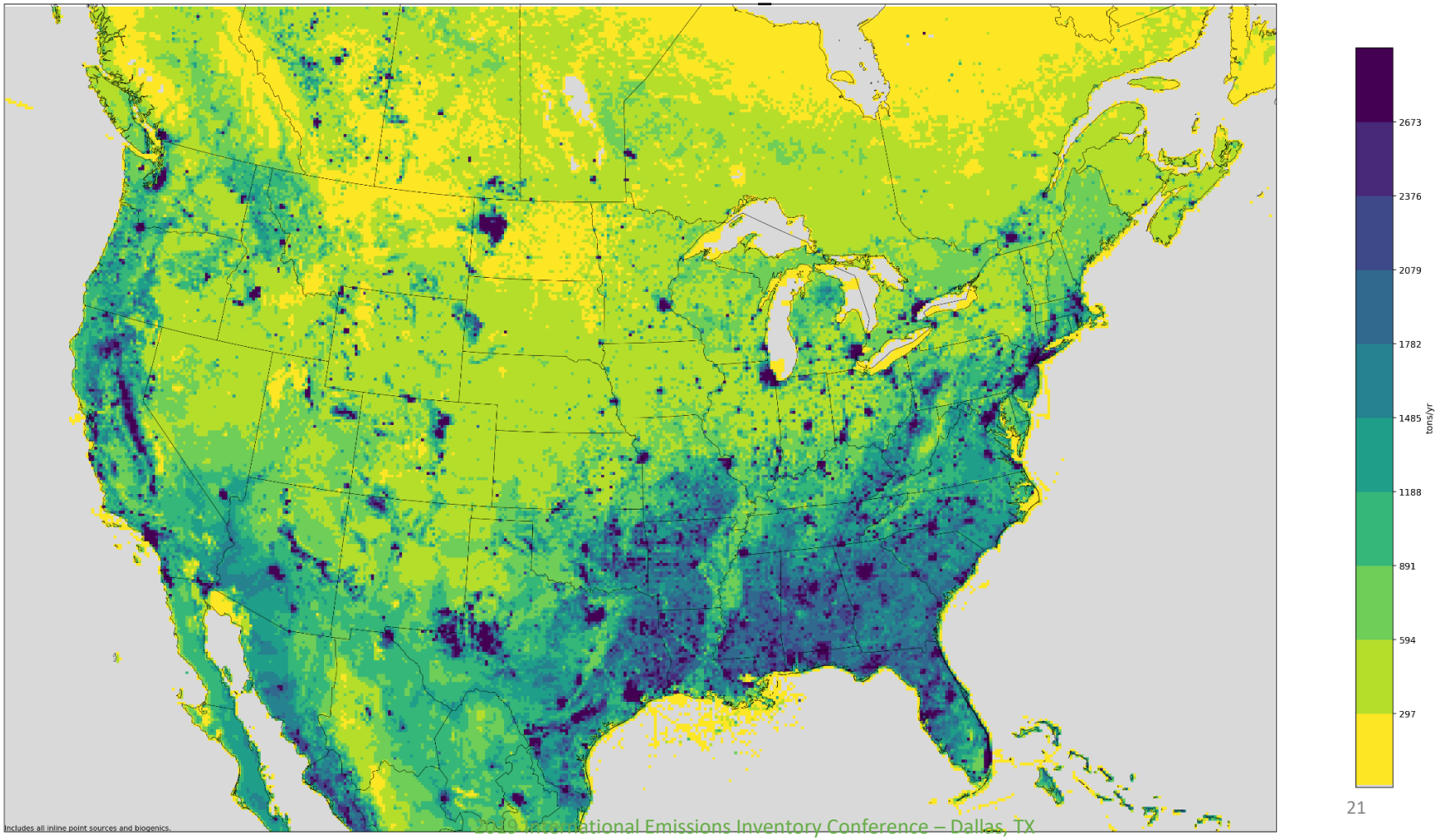




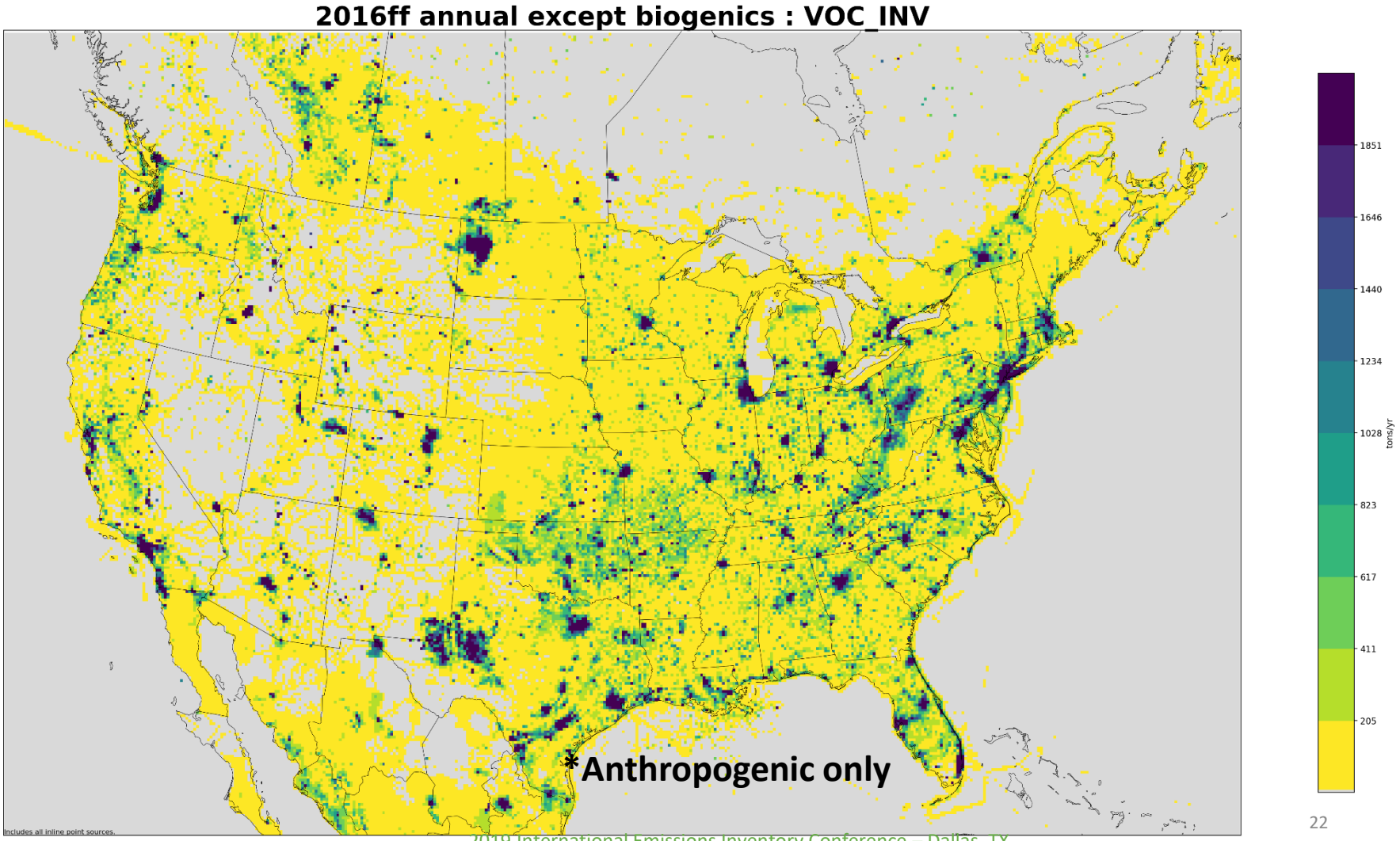
National VOC Emissions by Sector



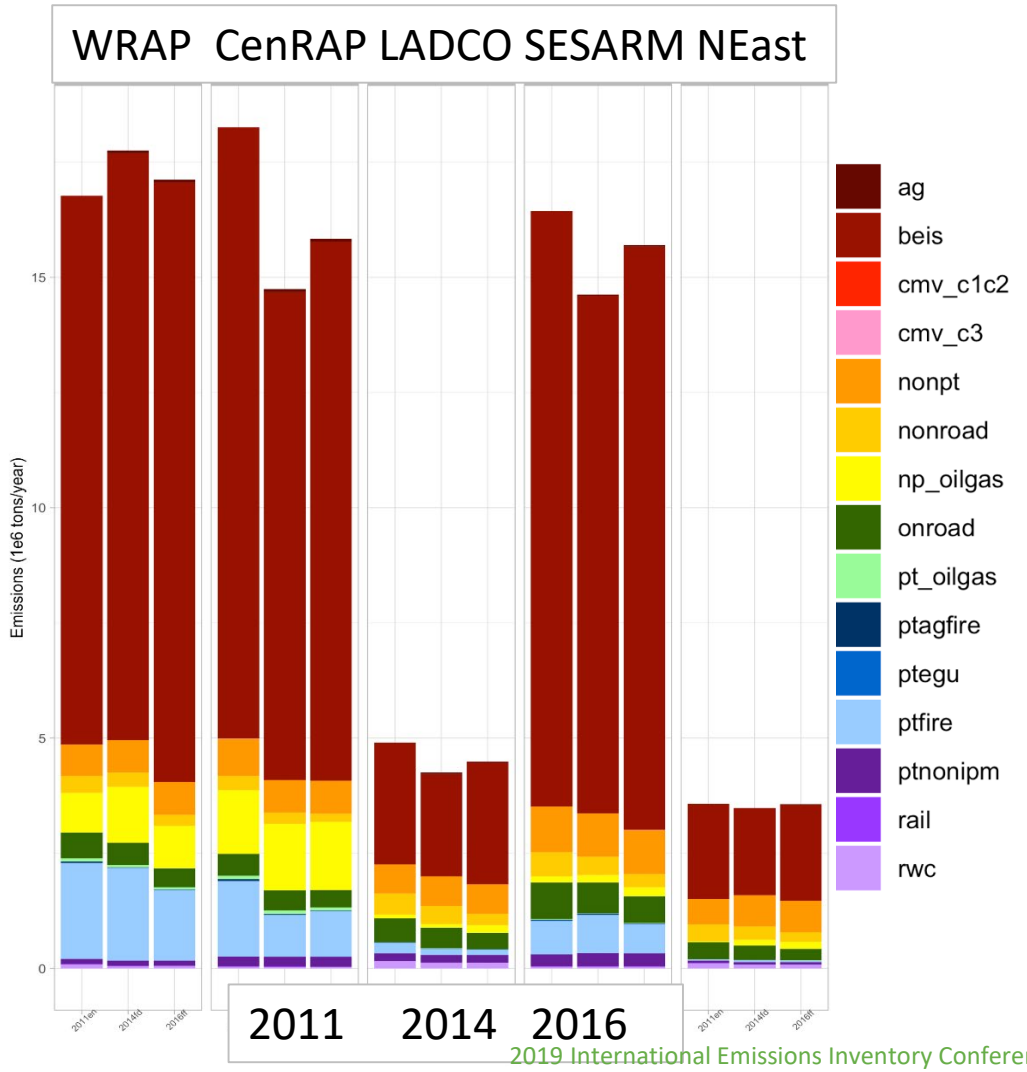
2016 Annual 12-km Gridded VOC Emissions (tons/year)



2016 Annual 12-km Gridded VOC* Emissions (tons/year)



Regional VOC Emissions by Sector

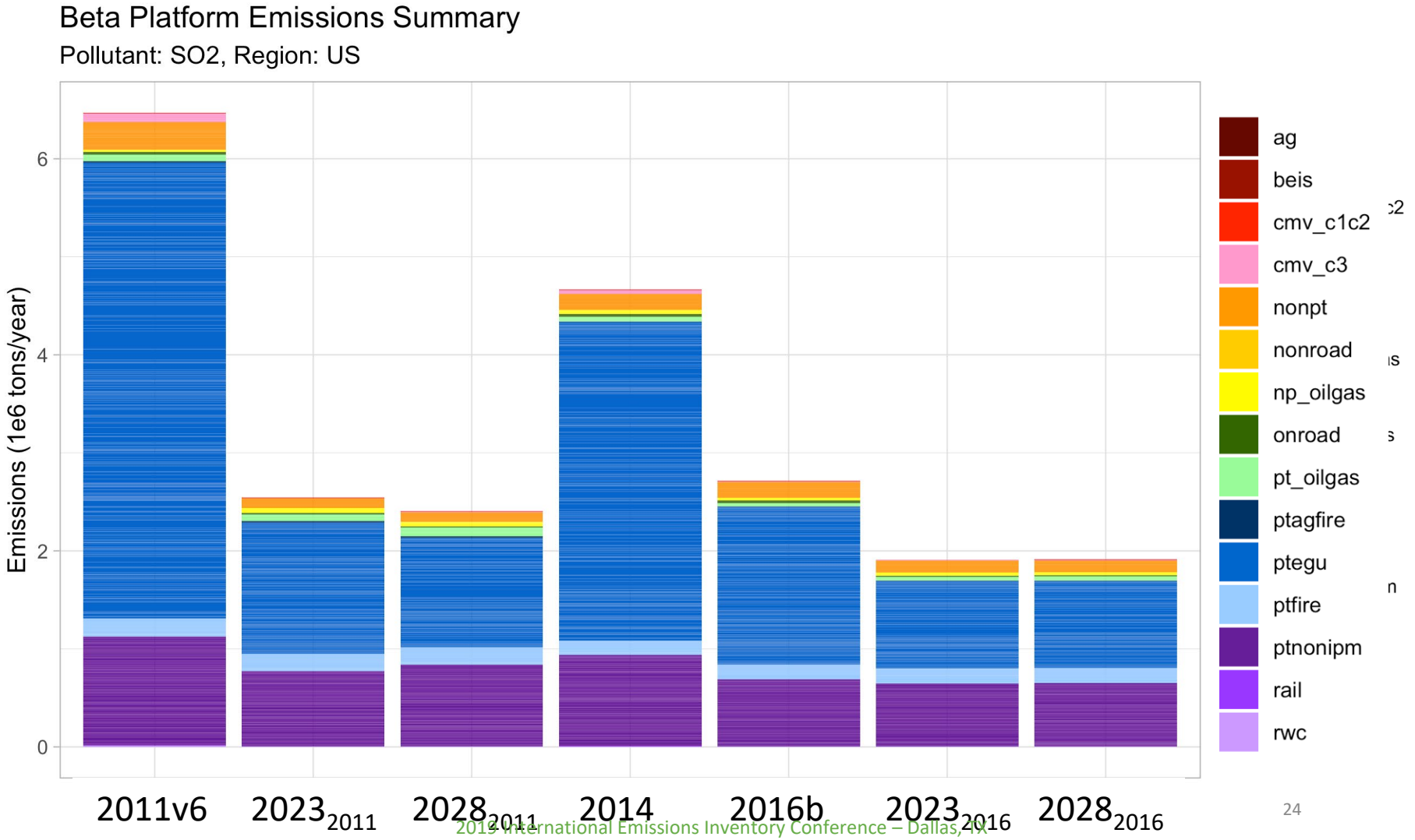


Biogenic signal dominates regions with states in the lower US latitudes, and west coast

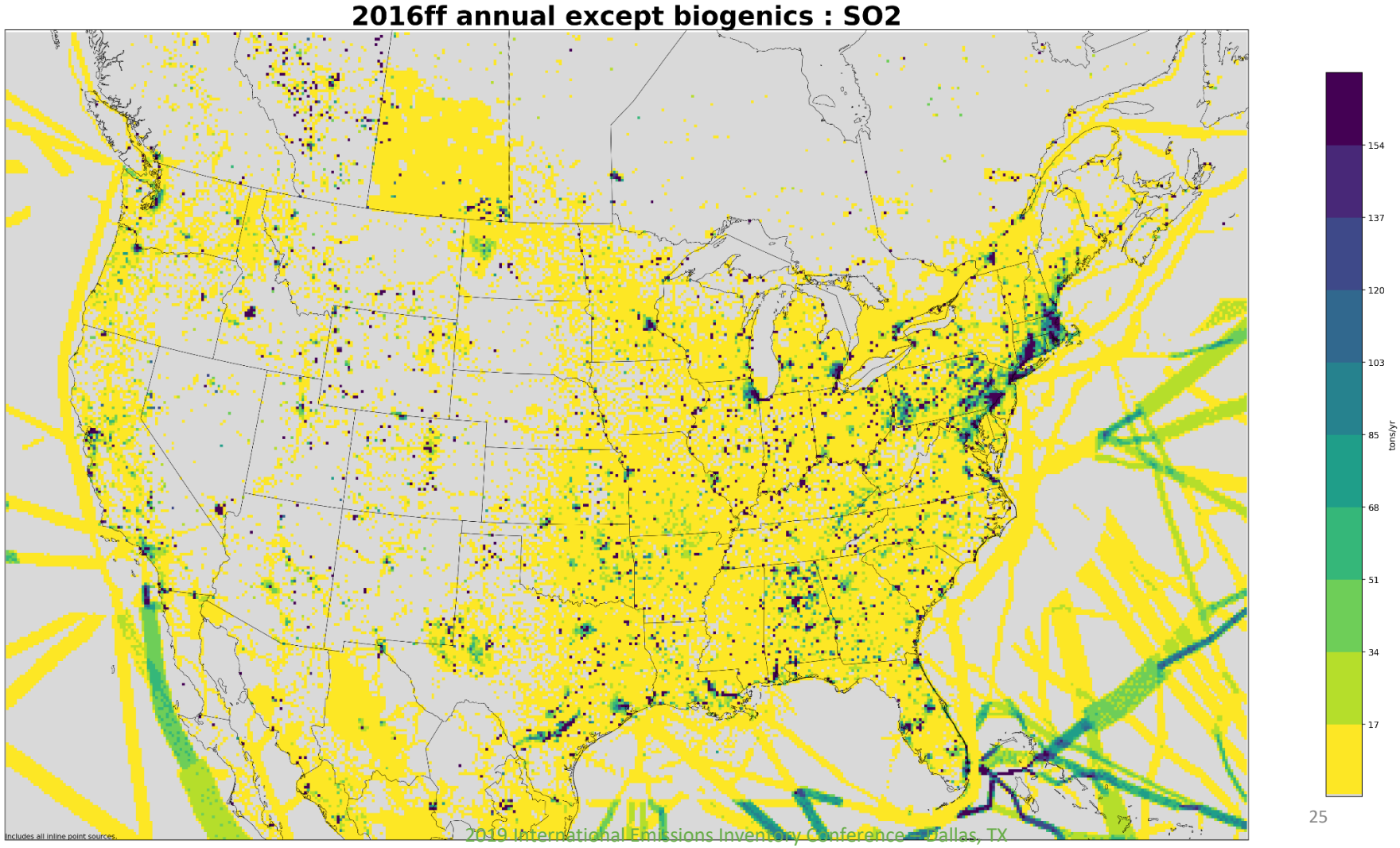
2014 → 2016 increase in biogenic VOC driven by meteorology: 2016 was warmer than 2014 in the Eastern half of the country

Increasing nonpoint oil&gas across all of the regions relative to 2011

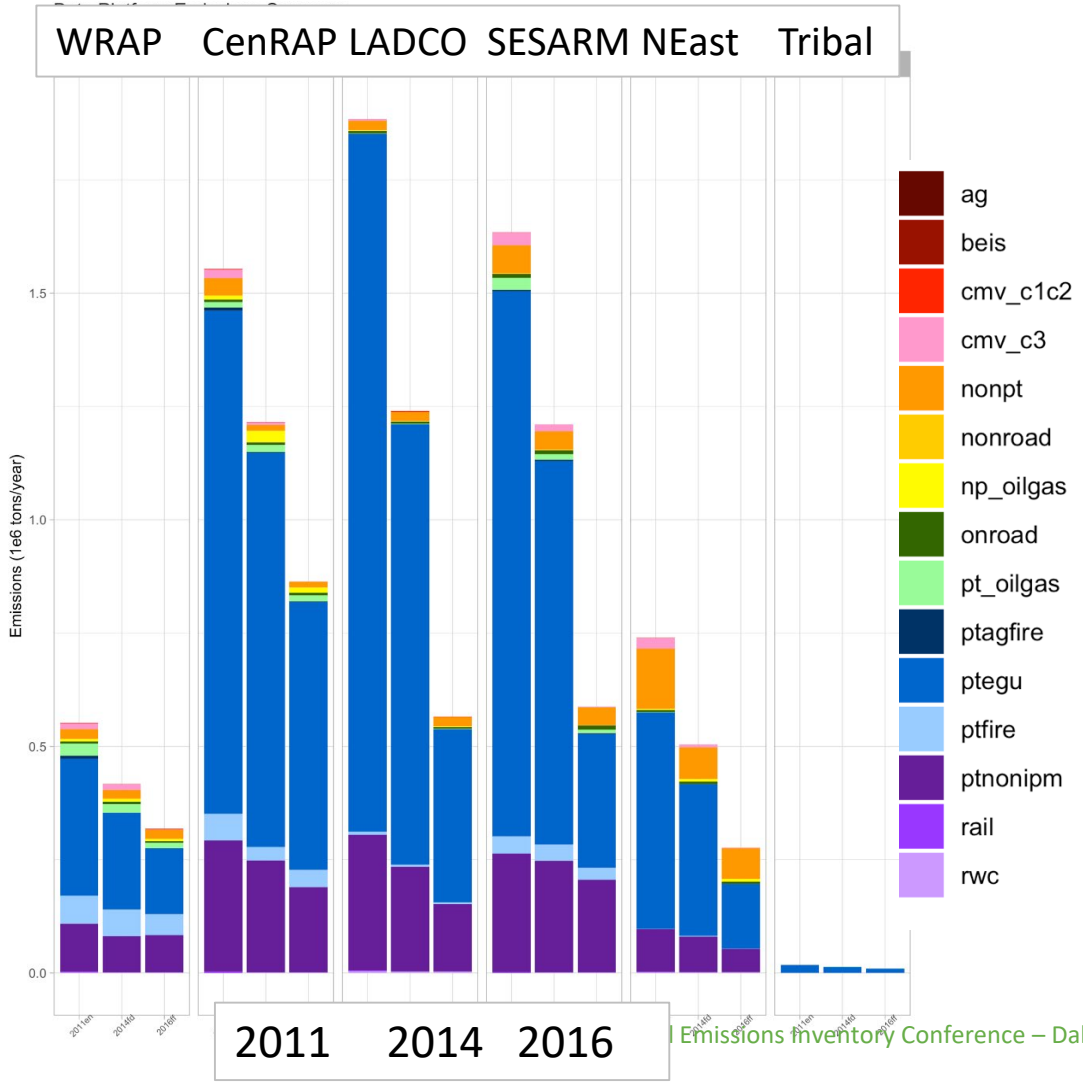
National SO_2 Emissions by Sector



2016 Annual 12-km Gridded SO_2 Emissions (tons/year)

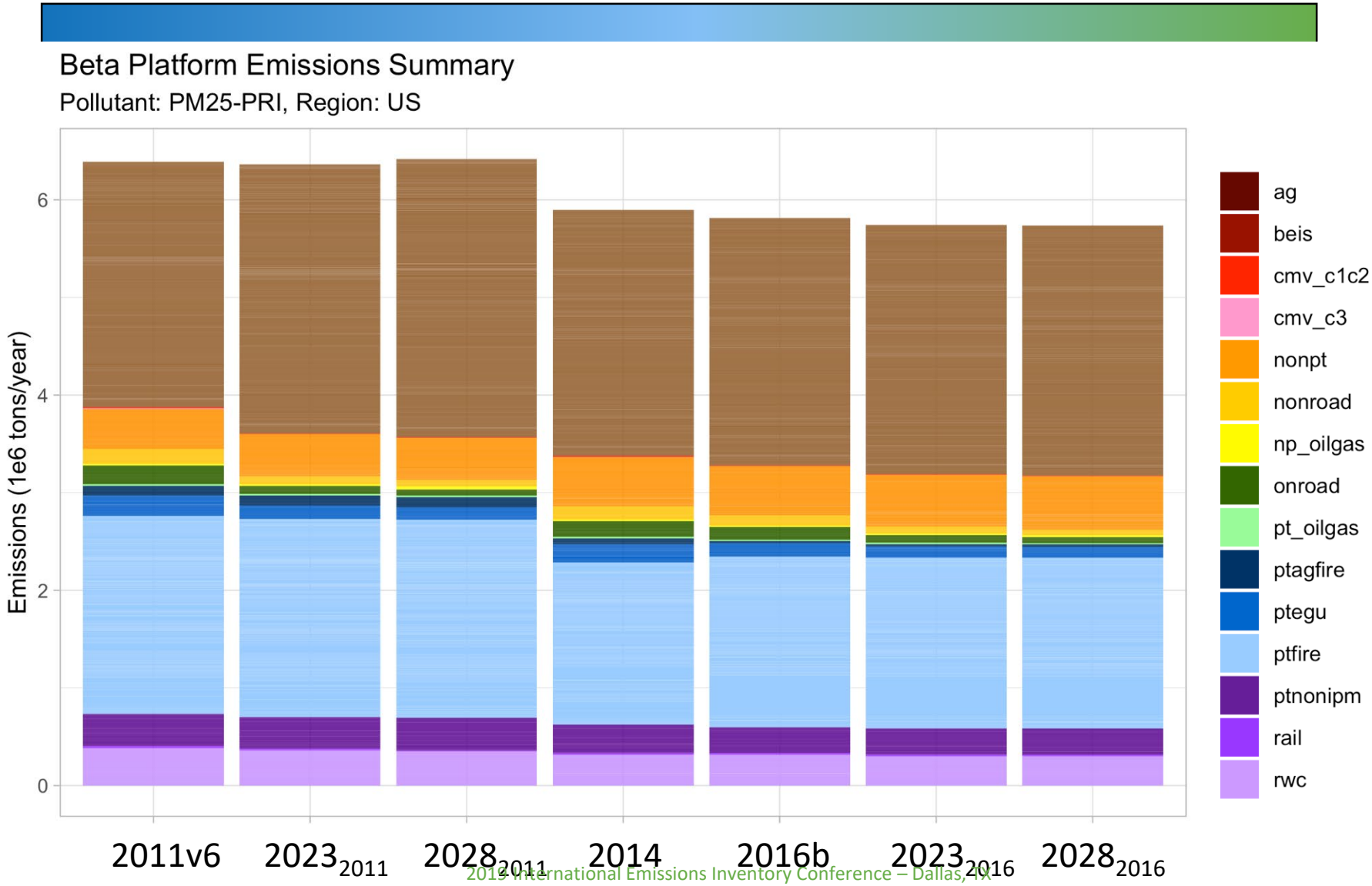


Regional SO_2 Emissions by Sector

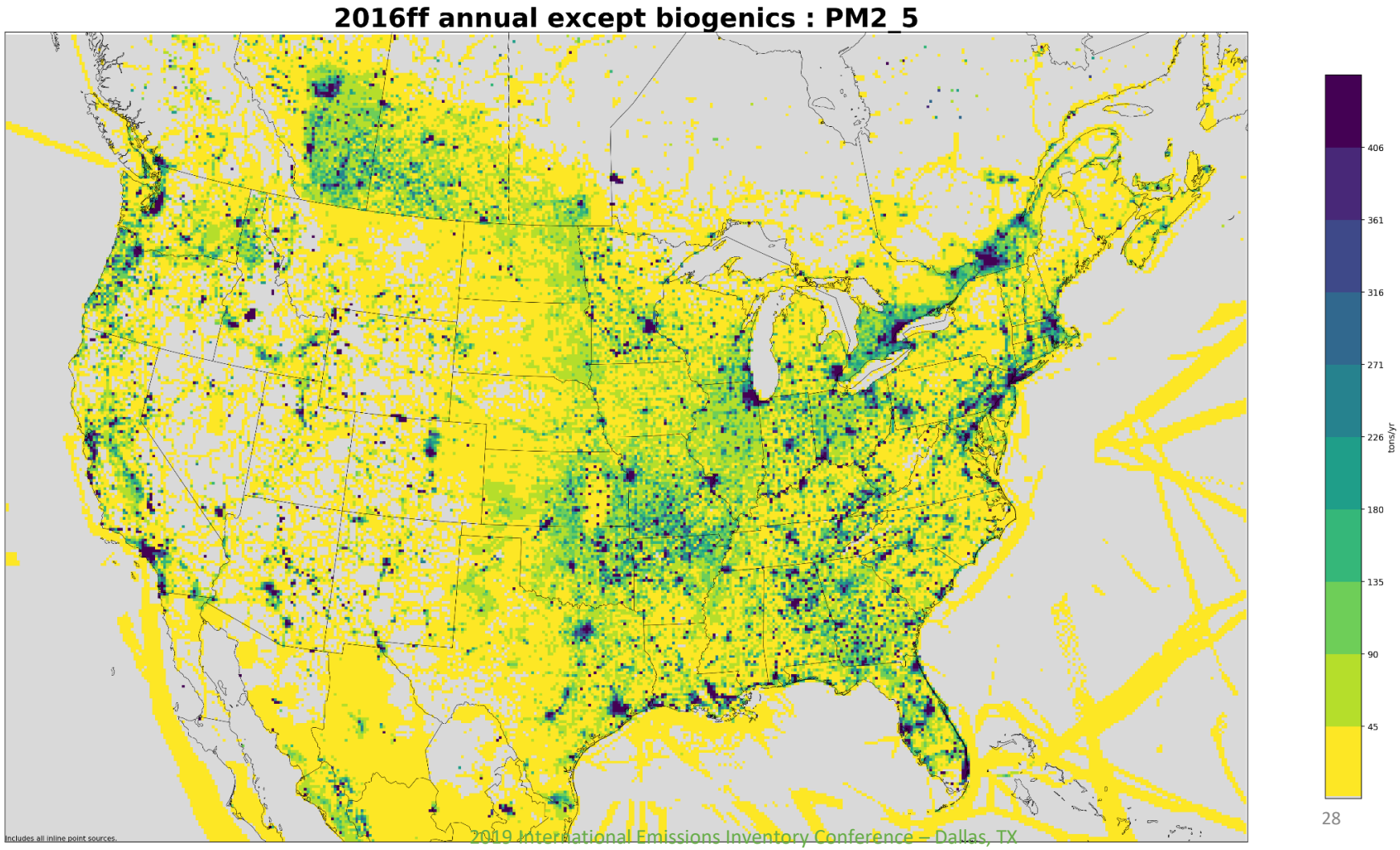


LADCO and SESARM region EGU and non-EGU point SO2 emissions heavily influence the national totals

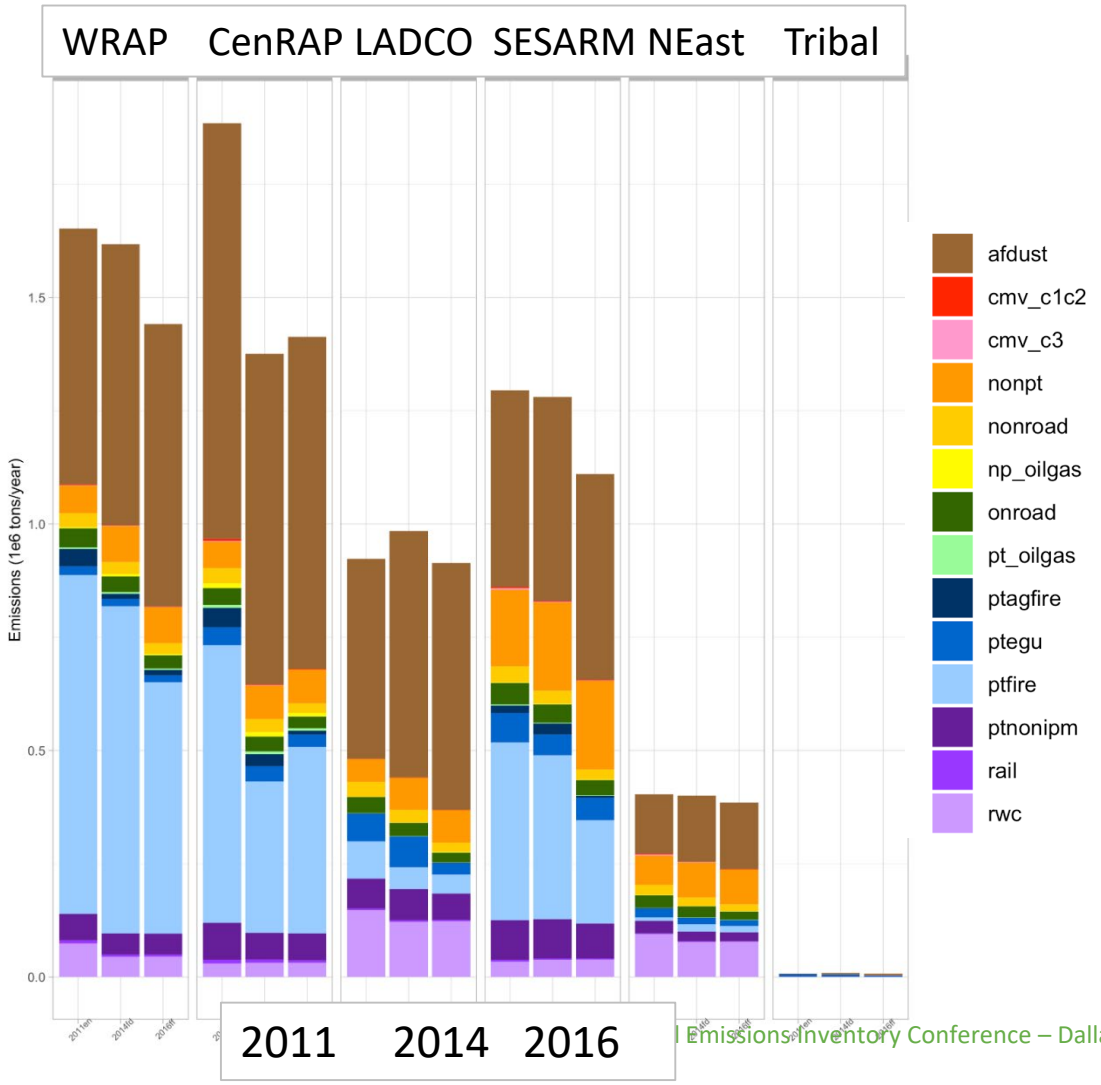
National $PM_{2.5}$ Emissions by Sector



2016 Annual 12-km Gridded $PM_{2.5}$ Emissions (tons/year)



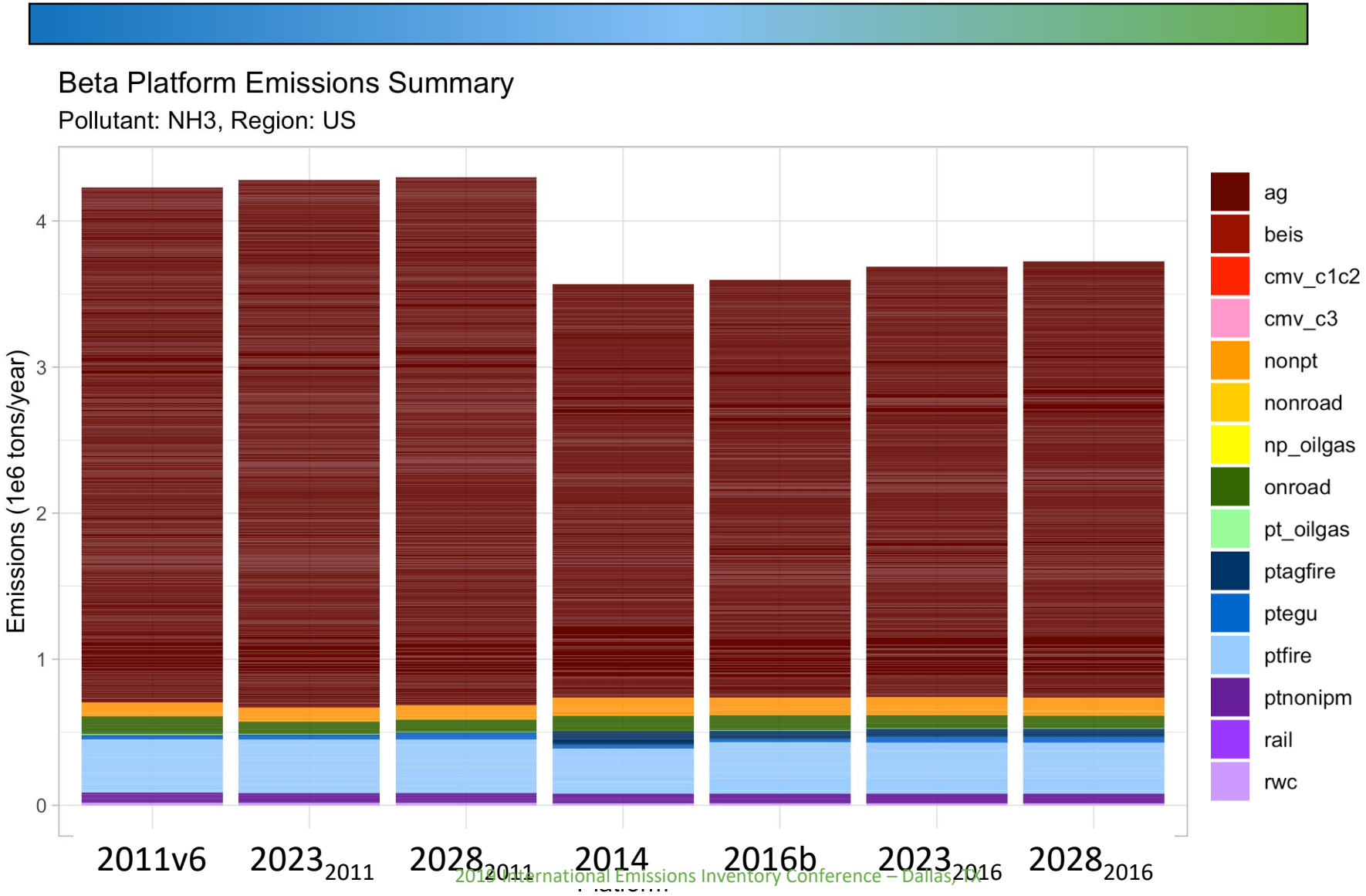
Regional $PM_{2.5}$ Emissions by Sector



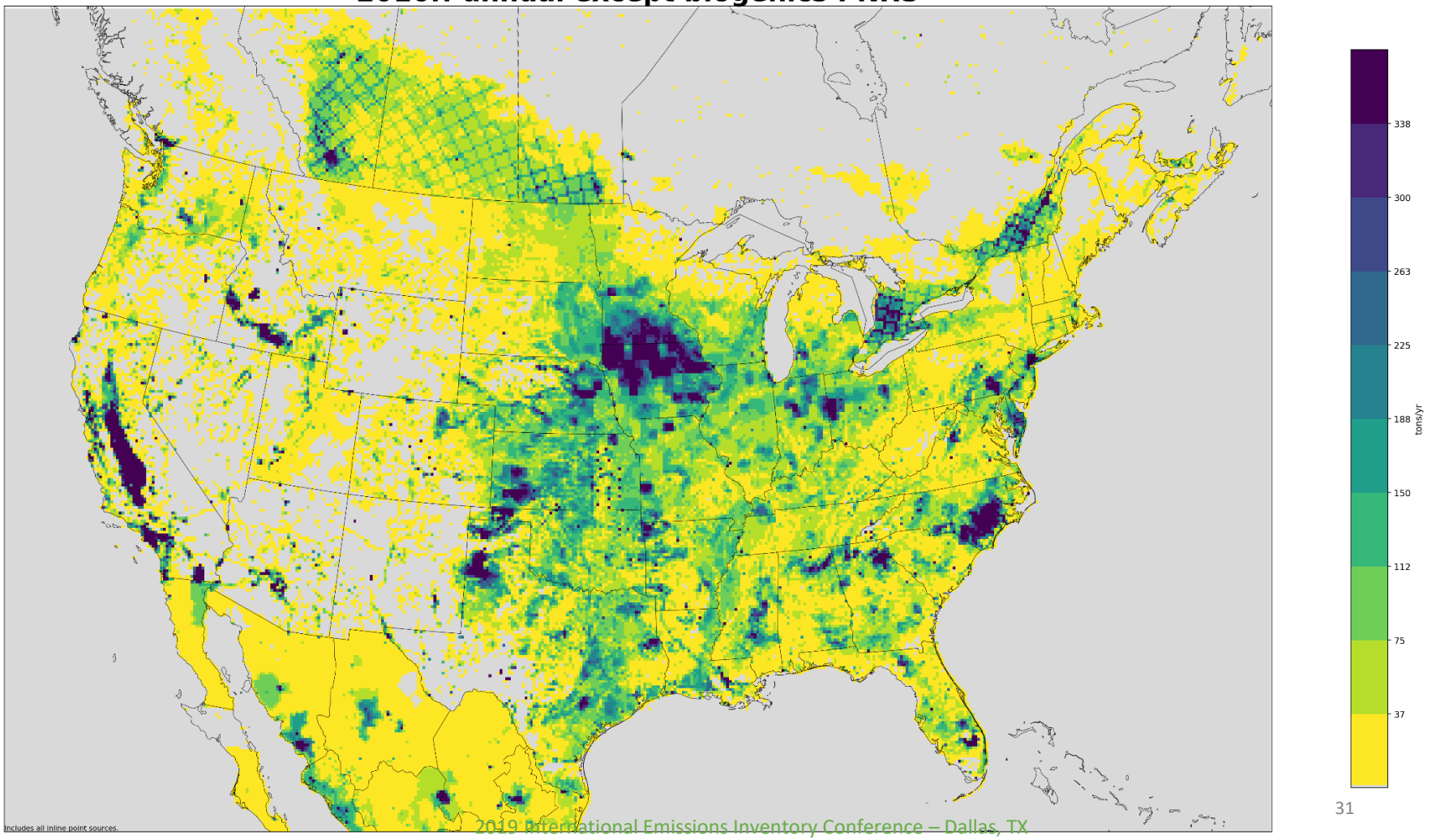
Changes to PM2.5 in 2016 relative to past inventories are driven by point fire, ag fire, RWC, non-EGU point

Reduction in point fire PM2.5 in the CenRAP region from 2011 to both 2014 and 2016 have a big influence on the national totals

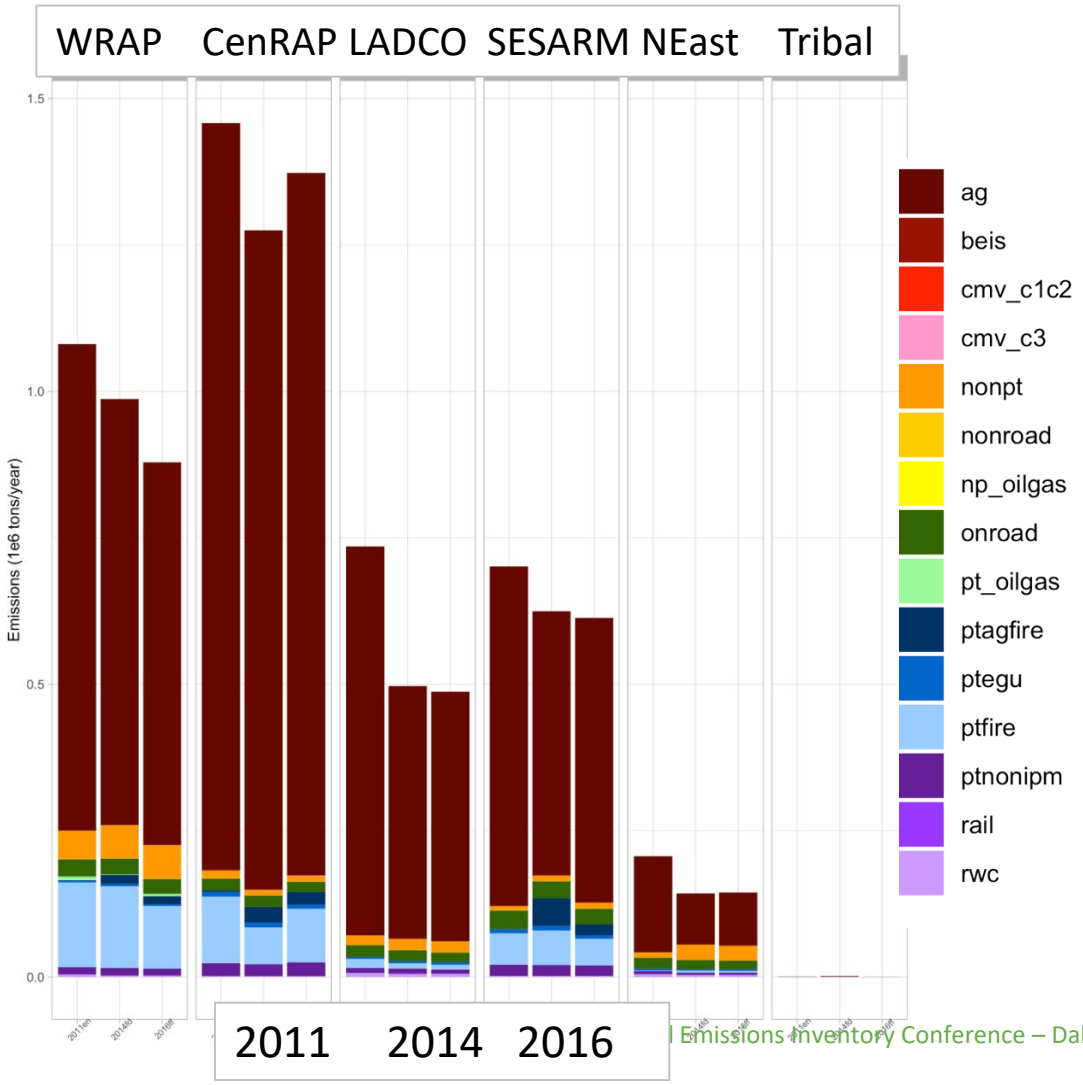
National NH_3 Emissions by Sector



2016 Annual 12-km Gridded NH_3 Emissions (tons/year)



Regional NH_3 Emissions by Sector



CenRAP is the dominant region for ag NH3; although largest changes from 2011 to 2016 in the WRAP and LADCO regions

Questions and Contact

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