

Emissions Inventory and Air Quality Modeling Activities for FAQS

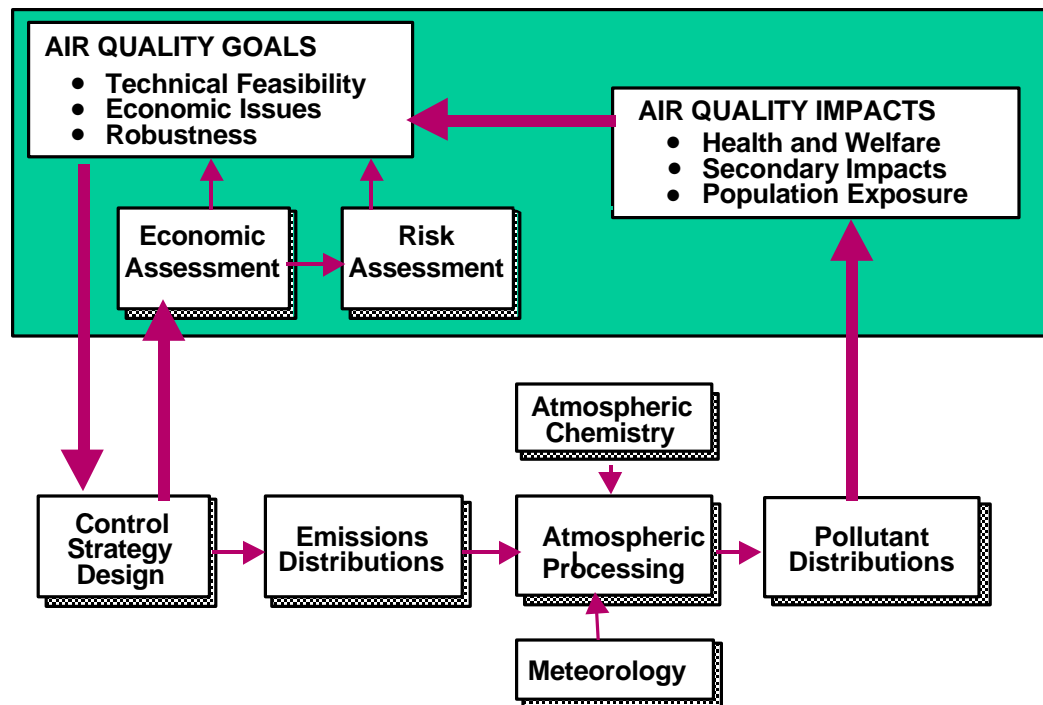
Ted Russell

October 20, 2000

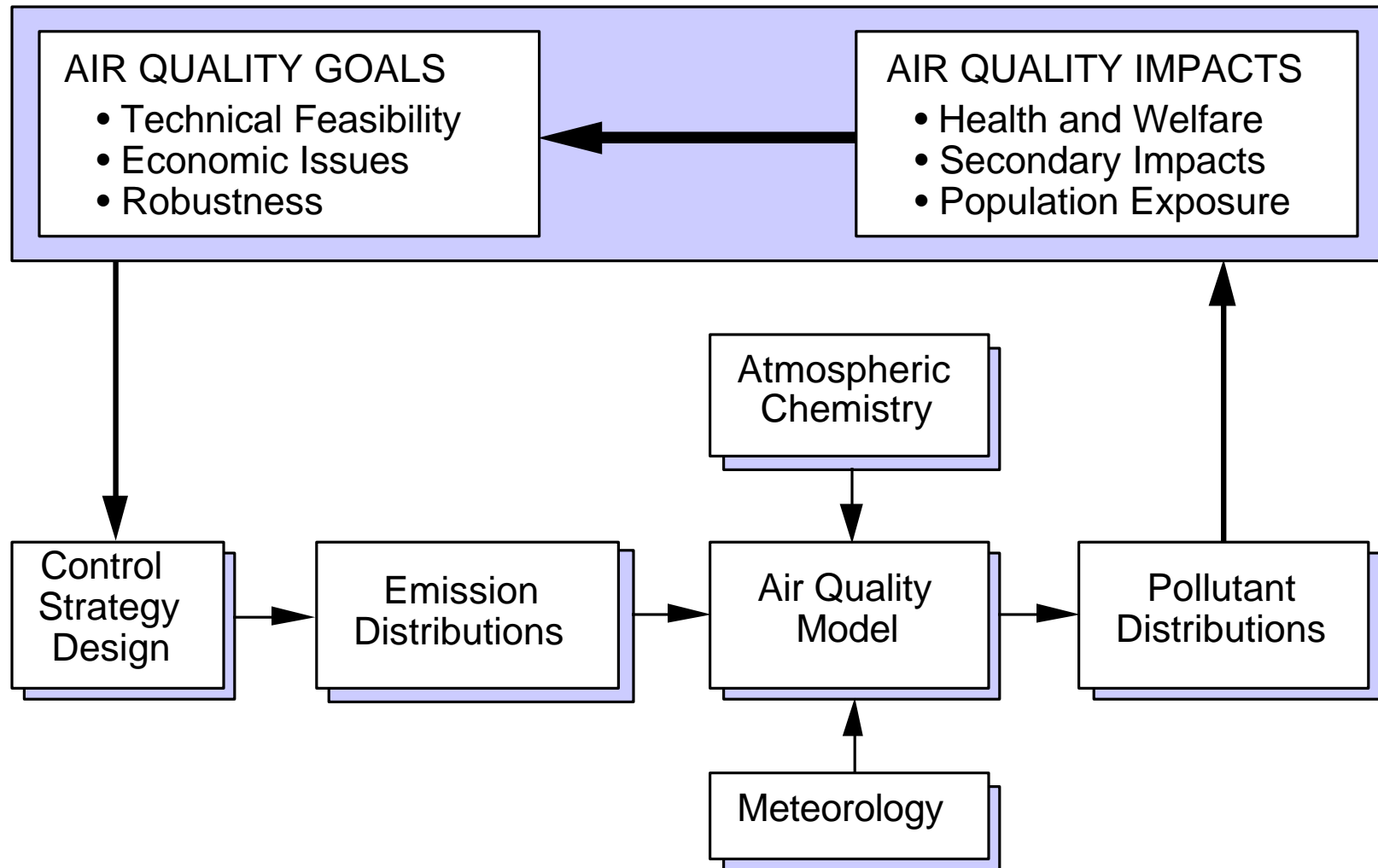
Acknowledgements

- Michael Baker
- Alberto Mendoza
- Talat Odman
- Scott Southwick (GA EPD)
- Southern Company
- And more to come
 - Sergey Napelenok
 - Dan Cohan

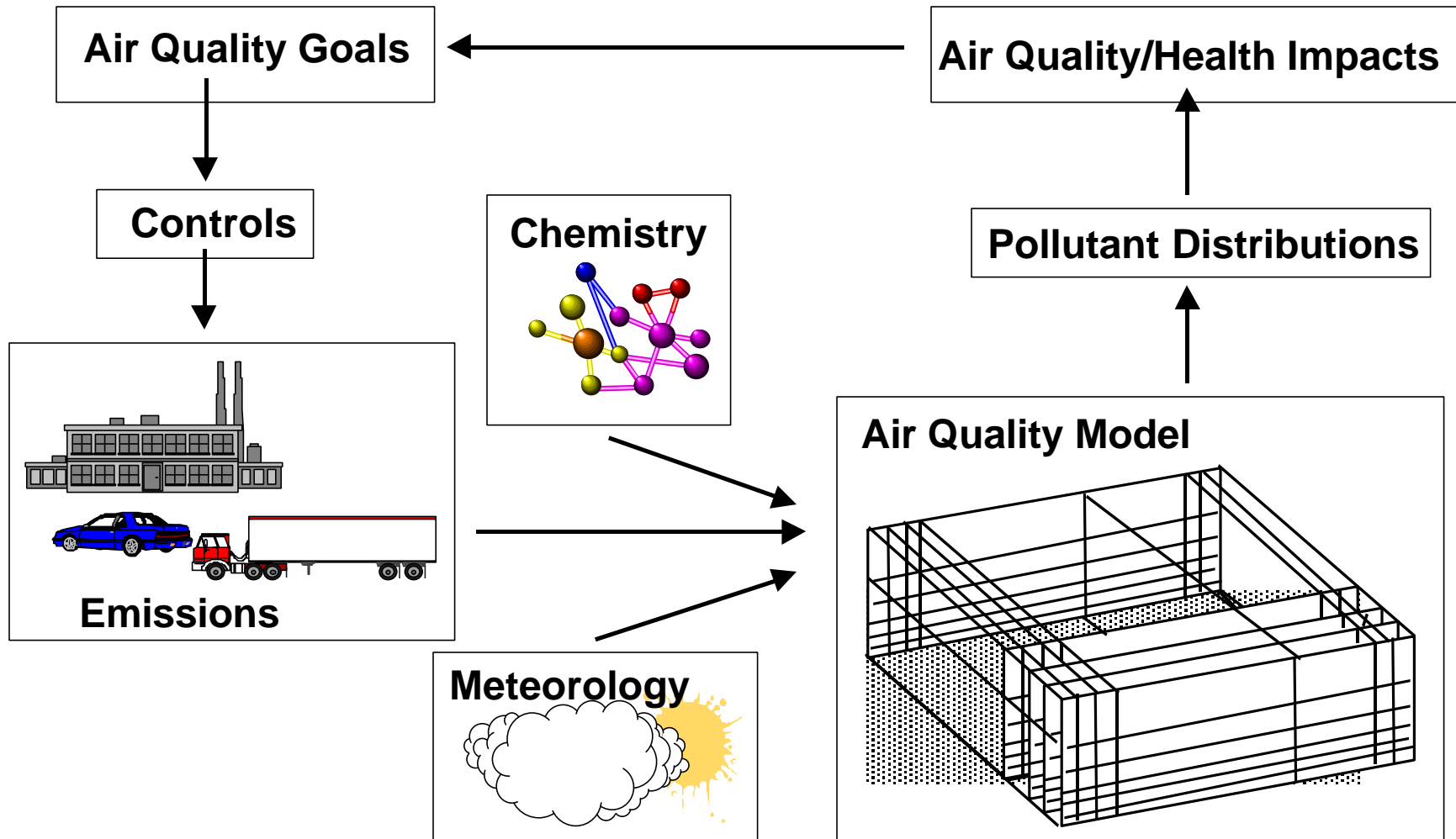
Air Quality Management



Role of Air Quality Modeling

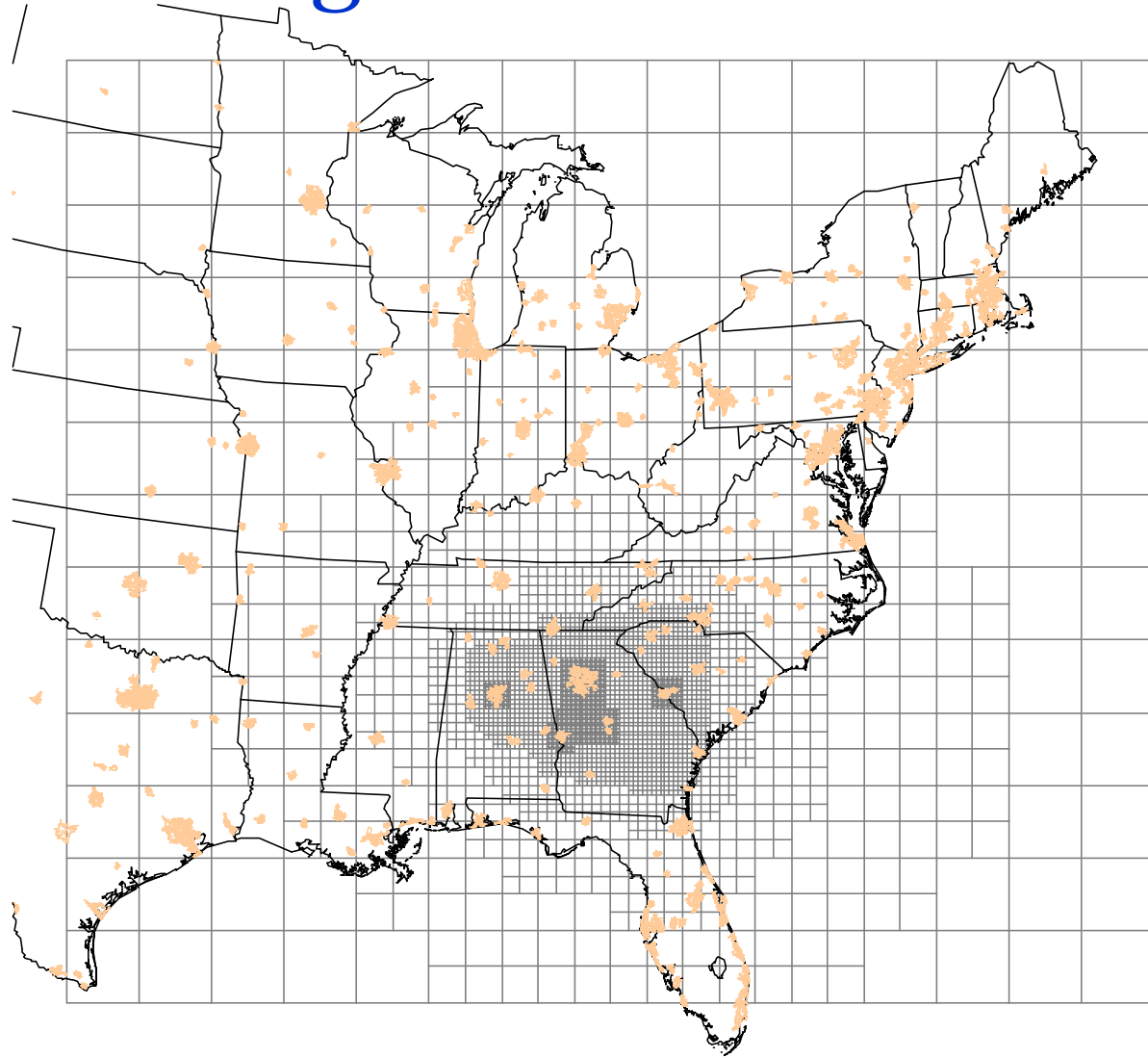


Air Quality Modeling



Modeling Domain and Grid

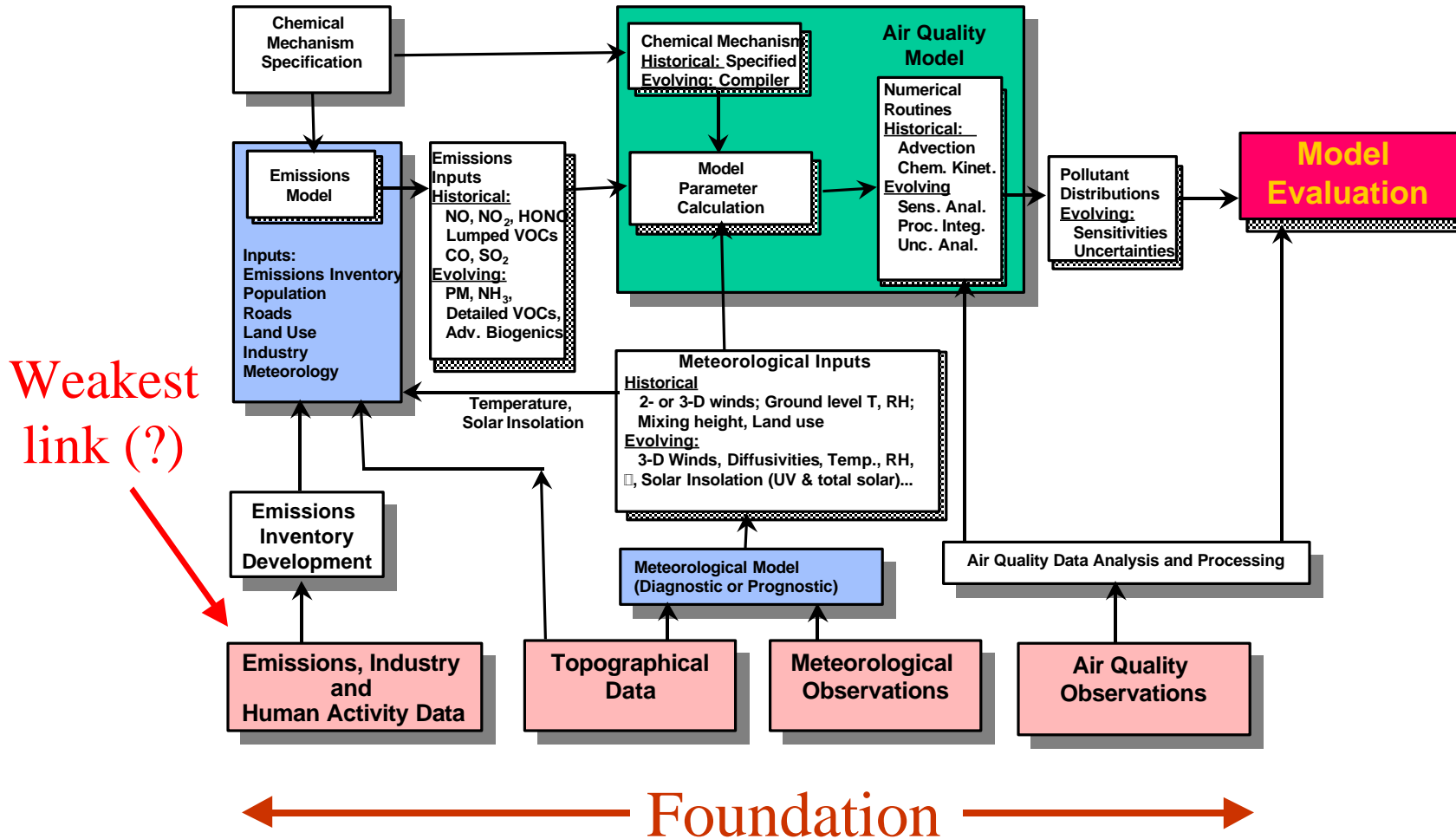
**Grid sizes
range from
6 to 192 kms
(for now)**



Air Quality Modeling is a Process

- Quality of results depend upon the inputs
- Inputs
 - Emissions
 - Speciated, temporally and spatially defined
 - Meteorology
 - 3-D temperature, winds, humidity, turbulence
 - Topography
 - Landuse, surface roughness, altitude
- Outputs
 - Concentrations
 - Deposition fields
- Modeling process
 - Develop inputs, apply model, evaluate
 - Confidence developed from (extensive) evaluation
 - Need (good) measurements
 - Major improvement to modeling process

Modeling Process



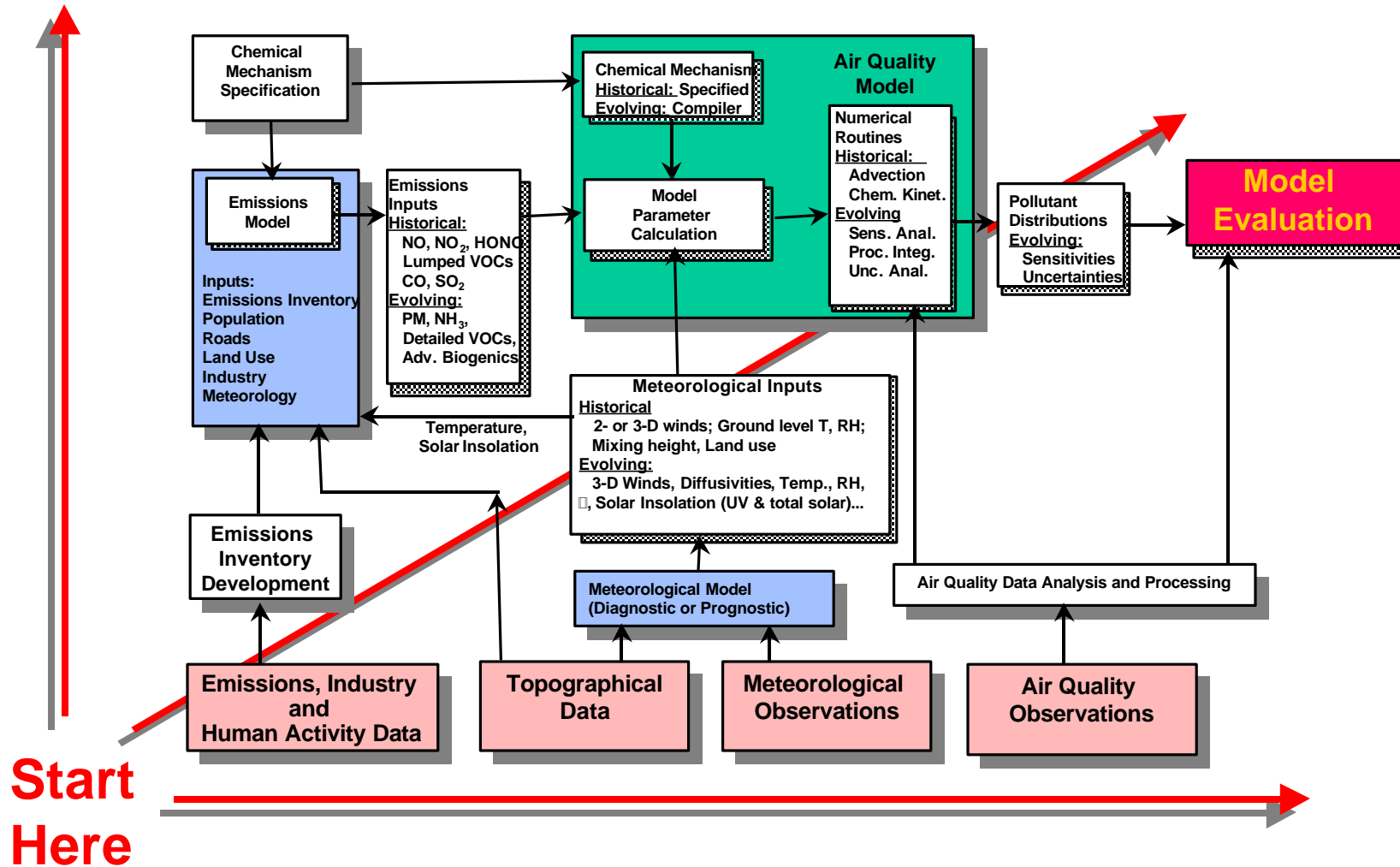
How Good Are They?

- All evidence suggests that they contain the processes most affecting the evolution of ozone and (if equipped) particulate matter (o.k., many components of PM)

However...

- Can not be used confidently without substantial evaluation
 - Not just ozone
 - Multiple locations
- Monitoring needed
 - Detailed and long term (a mixture)
 - Designed to identify major contributors (not just that a problem exists)
- Good emissions inventory is critical

FAQS Inventory and Modeling Activities



Emissions Inventory

- An emissions inventory is an estimate of the spatial and temporal magnitude of emissions of various pollutants from sources in a region
- Key to
 - Good model performance and reliability
 - Developing accurate source-air quality relationships
 - Identifying cost effective control strategies
- Usually cited as the most uncertain input in the modeling process

Emissions Inventory Development

- Emissions are seldom directly measured
 - Estimated from source activities and emissions factors, emissions models, land use, census, economic data, etc.
 - Significant uncertainties in relationships used
 - Possible (likely) biases
- Must account for 1000's of sources (actually, millions) many with significant variability

Phase I Emissions Inventory

Activities

- Survey of industrial emissions in FAQS areas
 - ~700 surveys sent out
 - In tandem with EPD survey of emissions from other industries in the state
 - Integrate detailed state inventory into regional inventory
- Grow/update current regional inventory
 - Grown to 1999 for SCISSAP modeling and emissions assessment
- Update mobile source inventory
 - MOBILE 6? (possibly MEASURE)
 - Traffic data as available
 - Improved PM precursor emissions data
 - Fuel-based inventory for cross-validation
 - May have major impact on FAQS area emissions

Emissions Inventory Activities

- Work with Alabama and South Carolina to get more detailed industrial inventory data for counties near Columbus and Augusta, respectively
- Work with AEPI/DoD facilities to improve military base emissions
- Compare current land-use data base being used in emissions processor with other data bases (e.g., more recent data)
 - Important for area source emissions
- Use inverse modeling to identify possible emissions inventory problems
 - Requires data (more than just ozone)

Emissions: Where are we?

- Surveys mailed: requested to be returned by end of November
 - EDI helping
 - Workshops planned:
 - Columbus: Oct. 30, 9:00-11:30
 - Macon: Oct. 30, 2:30-5:00
 - Augusta: Oct 31, 1:00-4:00
- Initial modeling and emissions assessment conducted
 - Results later in talk
- Discussions with other researchers/agencies about improving PM inventory

Phase I Modeling Activities

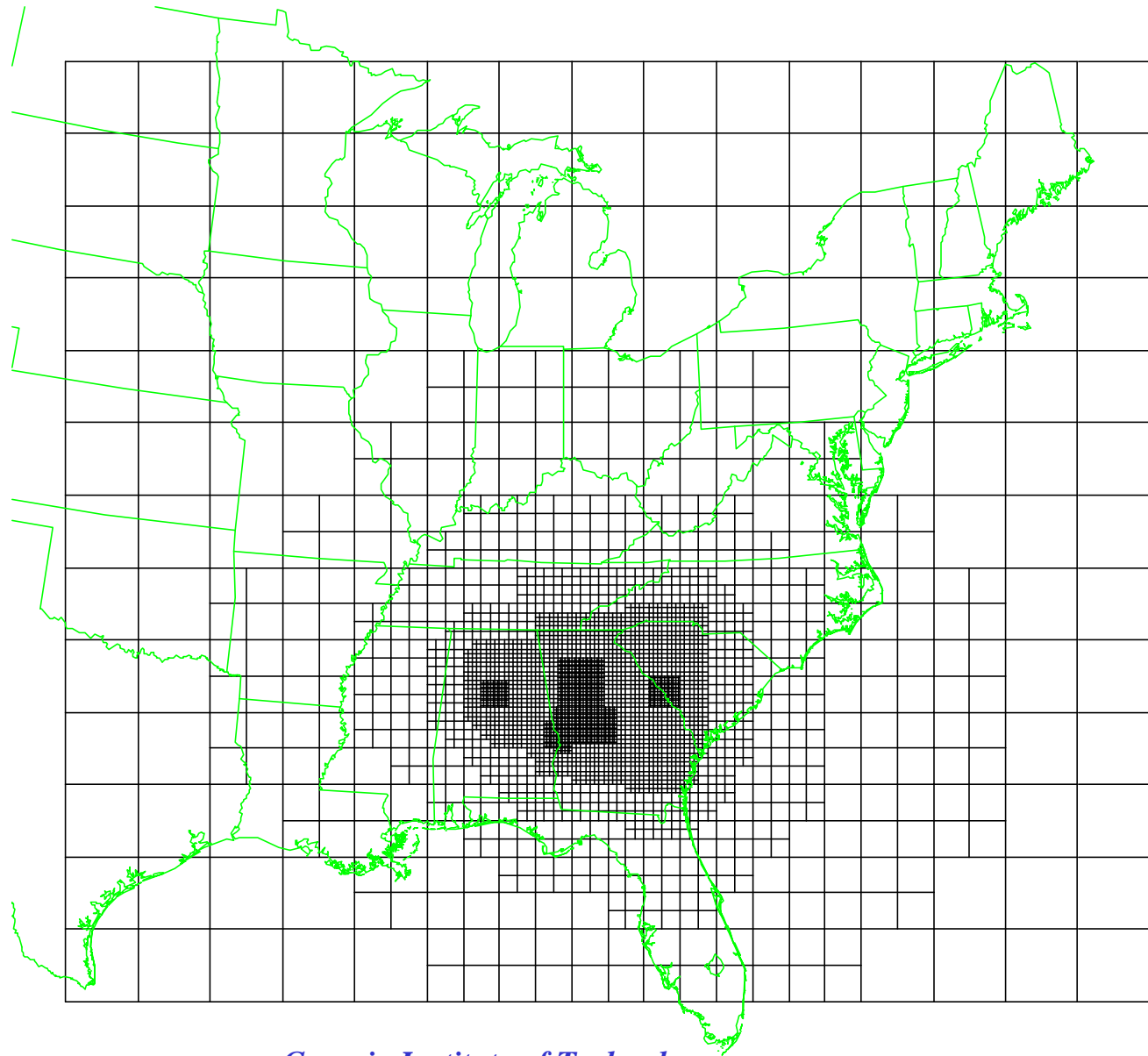
- Collect air quality and meteorological data
- Exploratory modeling of 1999 period
 - Identify emissions questions
 - Provide information for future experimental measurements
 - This is being done using URM
 - Wanted to get preliminary information quickly
- Start applying Models 3 to super-regional domain
 - Define nests
 - conduct initial modeling of 2000 episode
 - Why Models 3?
 - Likely model for widespread regulatory use in the future
 - Not a bad piece of code

Future Modeling Activities (PII...)

- Identify ~5 episodes for modeling
 - Preference to episodes captured by detailed monitoring in 2001 & 2002
 - May also choose episodes from other recent years (e.g., August 1999, July 17,18, 2000 and August 17, 2000)
 - Want representative episodes (episode selection criteria)
- Collect air quality and meteorological data
- Conduct meteorological modeling
 - MM5
- Conduct air quality modeling
 - Models 3
 - Evaluate
 - Use more than just ozone!
 - Identify likely problems (e.g., emissions)
- Test alternative control strategies
 - Provide model set-up and results to EPD

Modeling: Where are we?

- In conjunction with SCISSAP, have conducted modeling of 1999 episode
 - Integrated emission-based/receptor modeling for assessing emissions inventories
- Models 3 re-installed
 - Installed and used prior version 2 years ago... significant updates.



Preliminary

Suggested Emissions Adjustments

Source	Adjustment Factor
CO	1.1
SO ₂	1.1
NO _x (A)	1.8
NO _x (P)	1.2
VOC (A)	2.5
VOC (B)	1.2
NH ₃	0.6
Primary Organic Aerosol	1.1/0.5*

A=all ground level sources, P=all elevated sources, B=biogenic sources

Summary

- Emissions Inventory
 - Surveying begun
 - Workshops at end of October
 - Initial analysis of emissions conducted using observations
 - Mobile source updates could be significant
 - Other next steps include working with other states, analysis of area sources and PM precursor emissions
- Modeling
 - Initial modeling conducted using 1999 data
 - Installed and to be using Models 3 in future
 - Future activities include
 - Episode selection,
 - Met and air quality model application and evaluation,
 - Simulation of candidate emissions control strategies
 - Handoff of models, etc. to EPD+