Biome3

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National Emissions Inventory Conference
Denver Colorado

History

- Biome Created in 1993 as part of GEMAP.
- 1995 LADCO/OTAG use BEIS2 as model
- BIOME not used from 1995-2001
- BEIS2 had short-commings

BEIS2 Short-Commings

- Written in Fortran
- Visualization difficult
- New Summaries/reports difficult
- Model code “difficult” to interpret

BIOME Improvements

- Canopy Model
- Isoprene Ratio Options
- Guenther et al Isoprene algorithm
- BELD3
- New pollutants

Canopy Model

- GLOBEIS canopy model
- Attenuates sunlight through forest cannopy
- Based on the height of canopy
- Ability to select number of layers
- Methodology used in BEIS3

Isoprene Ratio

- Adjustment factor used in GLOBEIS
- BIOME3 allows user to specify value
- Based on difference between Cuvette measurements versus leaf enclosure measurements
- GLOBEIS value of 1.43

Improved Isoprene Algorithm

- Based on Guenther et al (2000)
- Leaf ageing(BEIS3?) Yes

Data Improvements(BELD3)

- 230 Land Use types
- 1KM cells
- Gridded using same projection as Eastern Unified Grid
- Processors that Spatially allocate BELD3 to a local grid
-

Emissions factors

- Updated to match BEIS3
- No change to Isoprene, monoterpenes, and NOX have little change
- Big changes for Methanol(MEOH) and 2-Methyl-3-Butenol(MBO)
- Allow individual chemical species to be modeled
- Speciation improvements on horizion

Emissions Factor Versions

- V1 - newest Emissions factors which include MEOH and MBO
- V2 - “Historical” of MBO or MEOH, Estimates are closer to BEIS2
- V3 - V1 with explicitly identified species

Photosynthetic Active Ratiation (PAR)

- 3 Different methods
  - MM5 Output
  - Models3 MCIP
  - BEIS2
- What is the right answer?

Running BIOME3

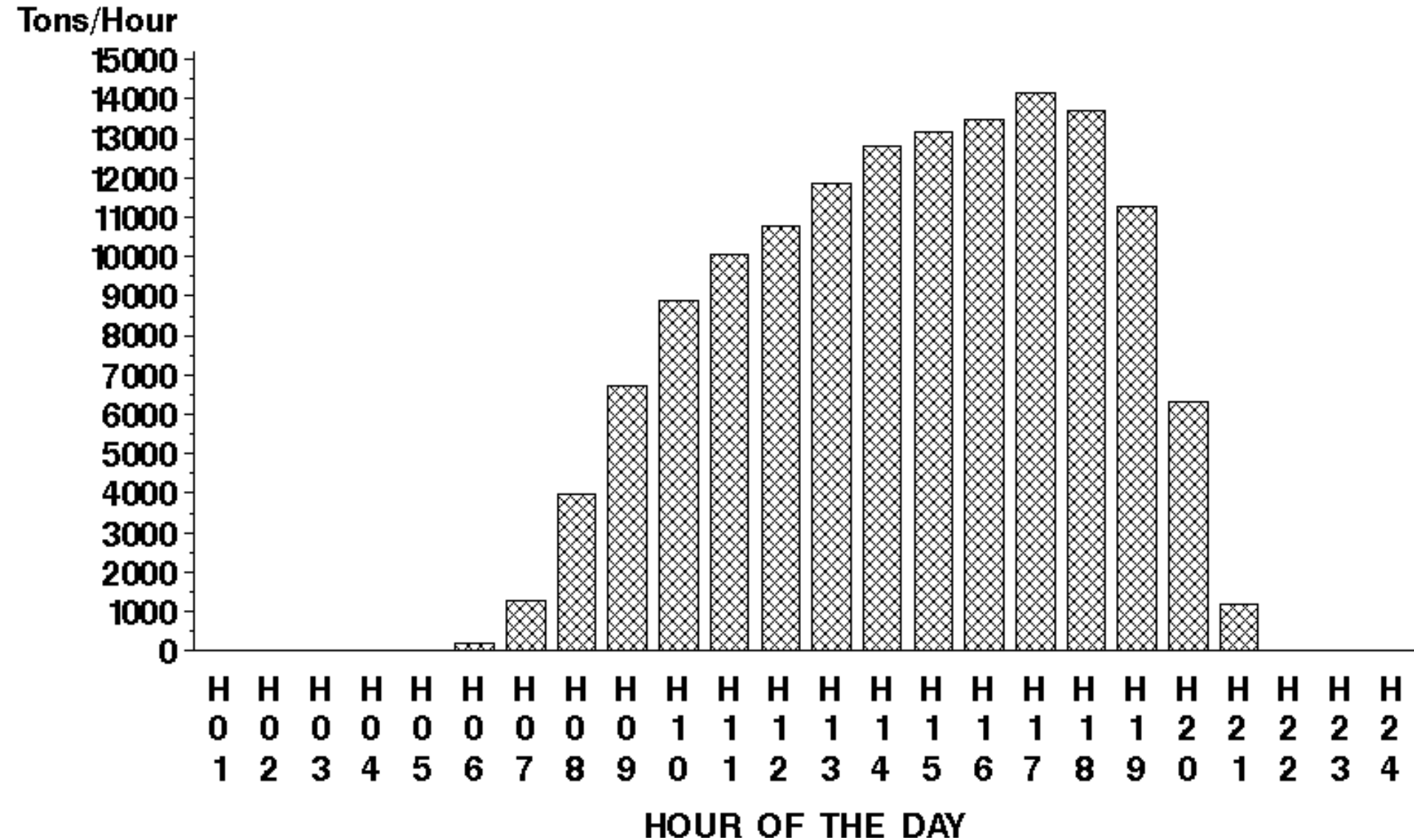
- Written in SAS (NO arc/info)
- Integrated with EMS-2001
- Load Emissions factors
- Subset BELD data
- Calculate emissions for a specific day
- Create chemical transport model files
- Run reports

Hourly Biogenic ISOP Emissions

File Used for Summary: ems_run.bioemis

Total Emissions: 139773.6

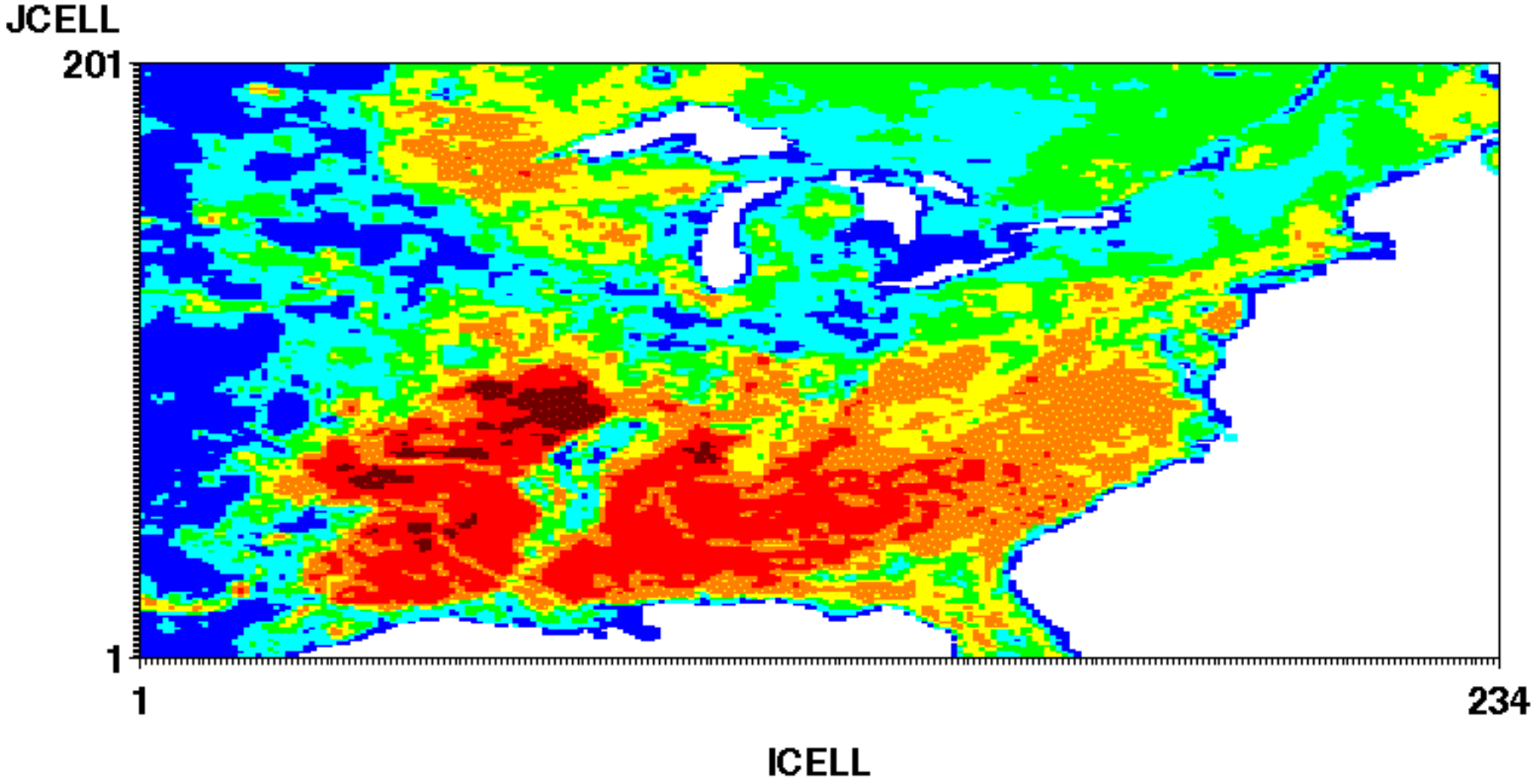
POLID= ISOP



Gridded ISOP Emissions

File Used for Summary: ems_run.bioemis

Total Emissions: 139773.6

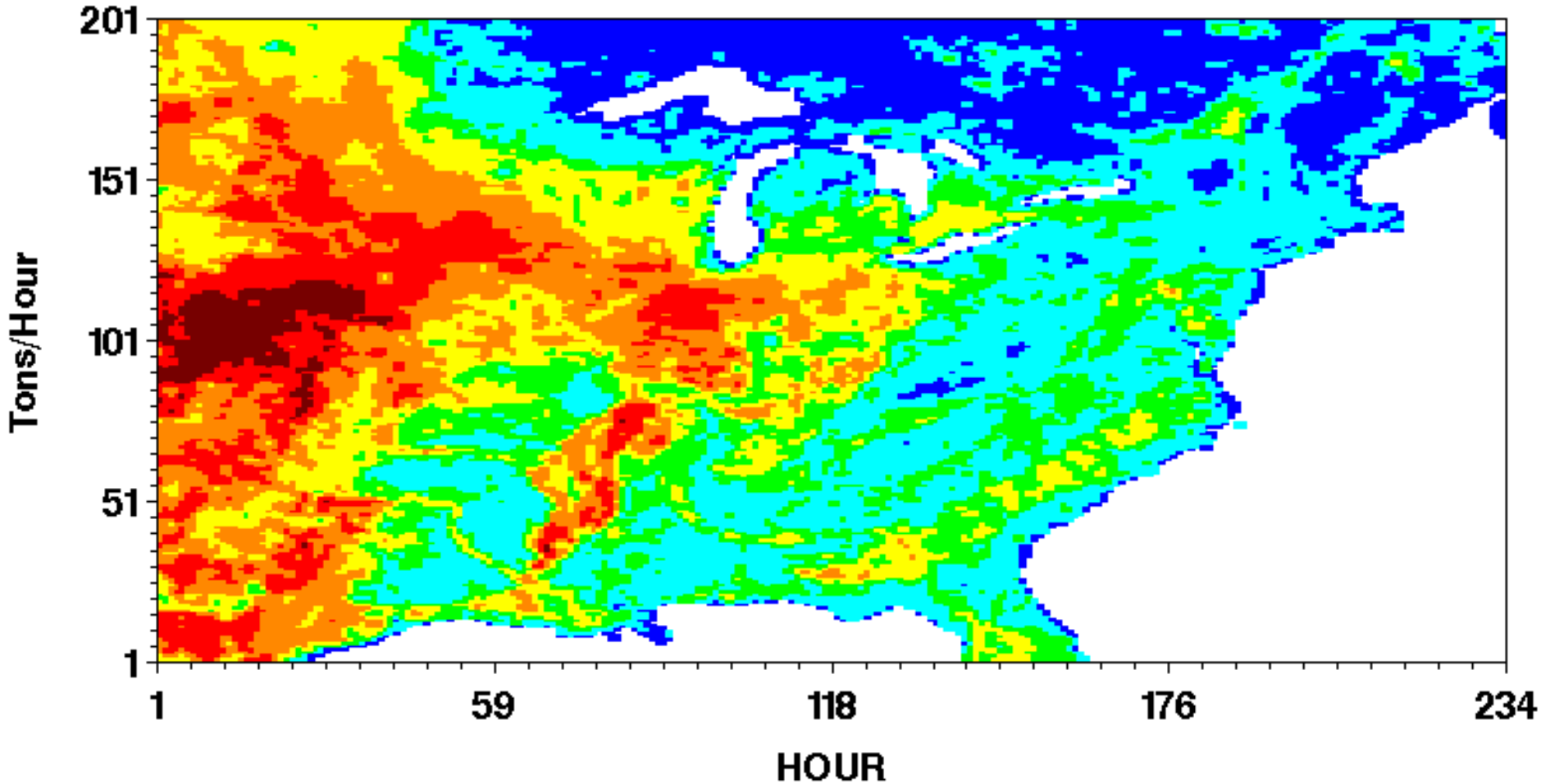


Legend values represent the midpoint of a range. Values chosen at the 0th, 5th, 20th, 35th, 50th, 65th, 80th and 95th percentiles.

Gridded NOX Emissions

File Used for Summary: ems_run.bioemis

Total Emissions: 5206.45



NOX (Tons/Day) Midpoints				
0.0001	0.0307	0.1114	0.2071	0.2754
0.3698	0.4765			

Legend values represent the midpoint of a range. Values chosen at the 0th, 5th, 20th, 35th, 50th, 65th, 80th and 95th percentiles

State*FIPS ID=17 State=Illinois

OBS	BEIS Species Code	BEIS Species Name	ISOP	NOX	OVOC	TERP
514	153	Oak_white	716.58	0.38	30.67	6.42
515	113	Oak_black	496.72	0.27	21.23	4.44
516	24	Corn	0.00	140.10	336.63	.
517	36	Soybeans	0.00	73.67	281.17	.
518	135	Oak_Northrn_red	281.85	0.15	12.12	2.54
519	12	USGS_decidforest	200.45	0.32	21.30	7.59
520	117	Oak_bur	181.69	0.11	8.14	1.70
521	139	Oak_pin	158.88	0.08	6.81	1.42
522	198	Populus	149.84	0.08	6.49	0.68
523	143	Oak_shingle	142.62	0.07	6.06	1.27
524	140	Oak_post	137.43	0.07	5.83	1.22
525	28	Misc_crop	0.00	25.28	65.73	4.36
526	81	Hickory	1.10	0.40	32.42	54.40
527	220	Sycamore	55.48	0.06	4.69	0.49
528	63	Elm	1.45	0.54	43.09	4.51
529	38	Wheat	0.00	10.84	37.64	0.79

LADCO Sensitivity Runs

Table 1. BIOME 3 Results for Selective sensitivities(Estimates for July 19th 1998).

Run#	Biogenics Algorithm	EF Version	Canopy Layers	Isoprene Divisor	PAR Source	Temp. Height	Isoprene tons/day	NOX Tons/Day	OVOC Tons/Day	TERP Tons/Day
B0	B3	V2	7	1	Pierce	1SM	139,773	5,206	38,747	34198
B1	B3	V1	7	1	Pierce	1SM	139,773	5,206	129,148	34198
B2	B3	V2	7	1	Pierce	surf	142,328	5217	38,865	43,297
B3	B3	V2	5	1	Pierce	1SM	139,322	5,206	38,747	34,198
B4	B3	V2	7	2	Pierce	1SM	102,521	5,206	38,747	34,198
B5	B3	V2	7	5	Pierce	1SM	80,171	5,206	38,747	34,198
B6	B2	V2	7	1	Pierce	1SM	131444	5,206	38,747	34,198
B7	B3	V2	7	1	Wilkinson	1SM	119,983	5,206	38,747	34,198
B8	B3	V2	20	1	Pierce	1SM	139,981	5,206	38,747	34,198
B9	B3	V2	3	1	Pierce	1SM	134,043	5,206	38,747	34,198

Future Directions

- Speed Up BTAP 2.7 Hours to 25 Minutes per day
- Reporting Improvements.
- BELD3 data improvements
  - Chicago Oak - 2X higher than BEIS2
- Speciation