The California and Nevada Smoke and Air Committee Modeling on Demand for Fire Response

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Desert Research Institute

CANSAC
California and Nevada
SMOKE AND AIR COMMITTEE

CEFA
Climate
Ecosystem
Fire / Applications

Brief summary of CANSAC

- Conceived in 2002
- Began operations in May 2004
- Oversight and funding support by inter-agency Board of Directors
- Product requirements provided by inter-agency Operational and Applications Group

Supporting agencies

USDA Forest Service Region 5

National Park Service

Bureau of Land Management California

USDA Forest Service Washington Office

California Air Resources Board

San Joaquin Valley Air Pollution Control District

Bay Area Air Quality Management District

Monterey Bay Unified Air Pollution Control District

CAL FIRE (contract in execution)

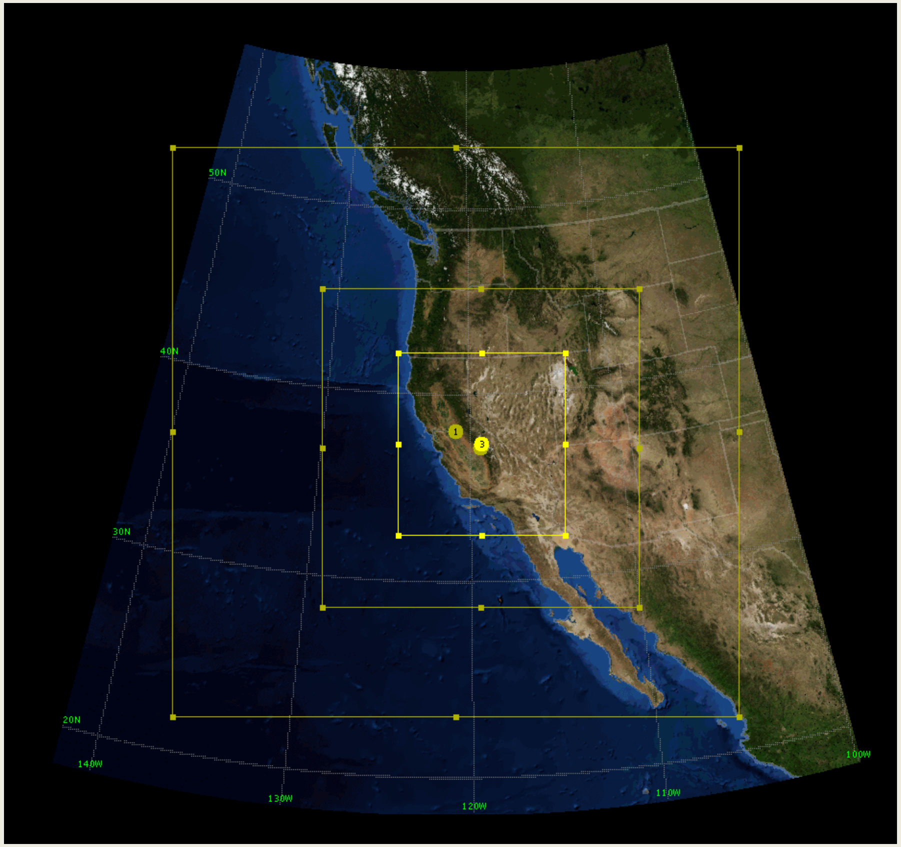
Why CANSAC is important

- Provides high-spatial and temporal resolution fire weather forecast information used for:
  - Identifying potential adverse effects on fire spread and behavior
  - Timing of critical weather events
  - Decision support for tactical and strategic briefings
  - Identifying critical fire weather and smoke dispersion patterns

- Creates the foundational operational dataset from which most operational smoke management and air quality management decisions are derived
  - Bluesky operational smoke forecasting systems
  - Bluesky Playground on which most Rx forecasting and planning are based on a daily basis

Modeling system

- Utilizes the Weather Research and Forecast (WRF) model
  - Hourly forecasts out to 72 hours
  - Surface plus 32 atmospheric levels
- Output grids sent to USFS Seattle AirFire group for Bluesky processing

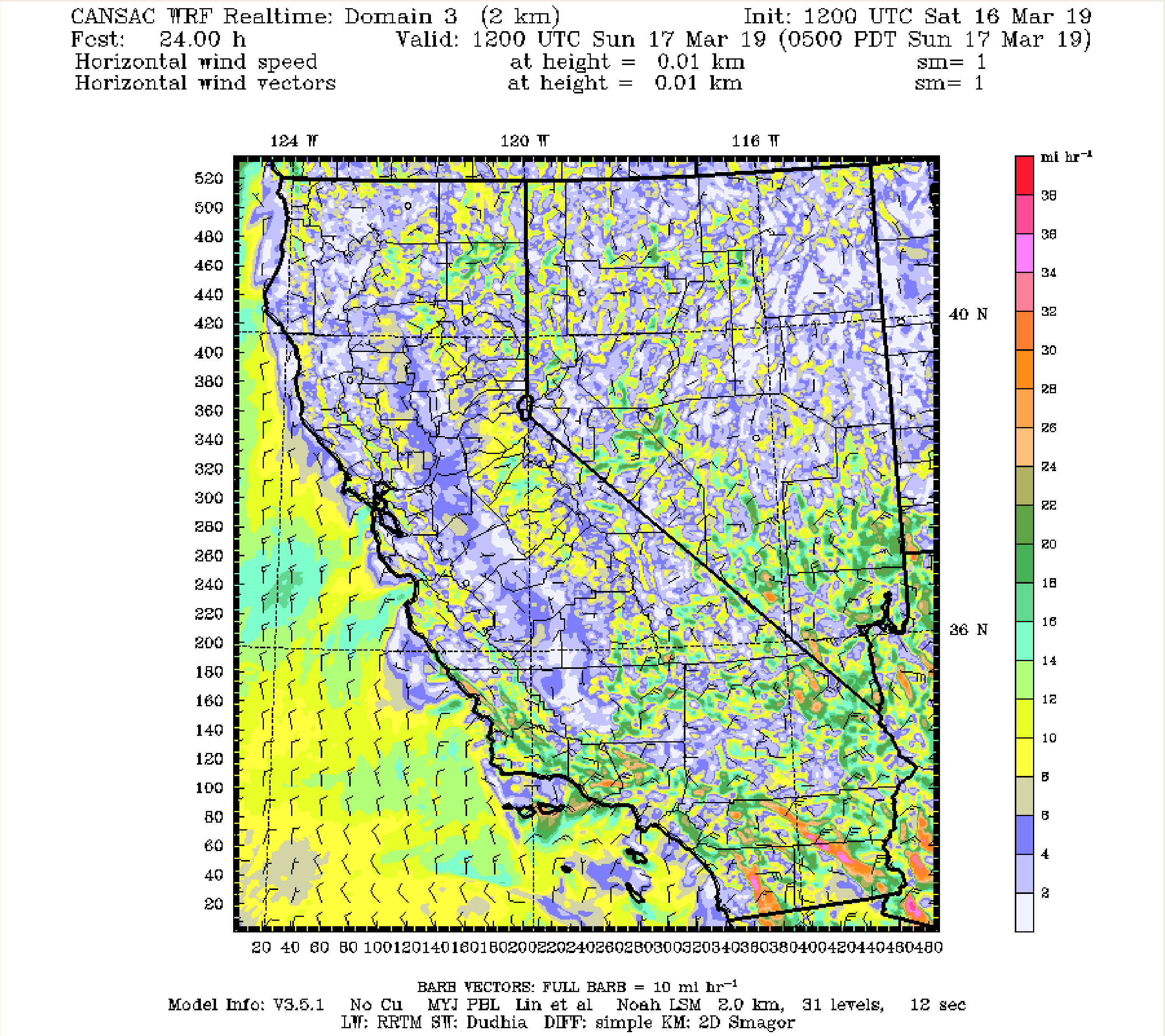


Example products

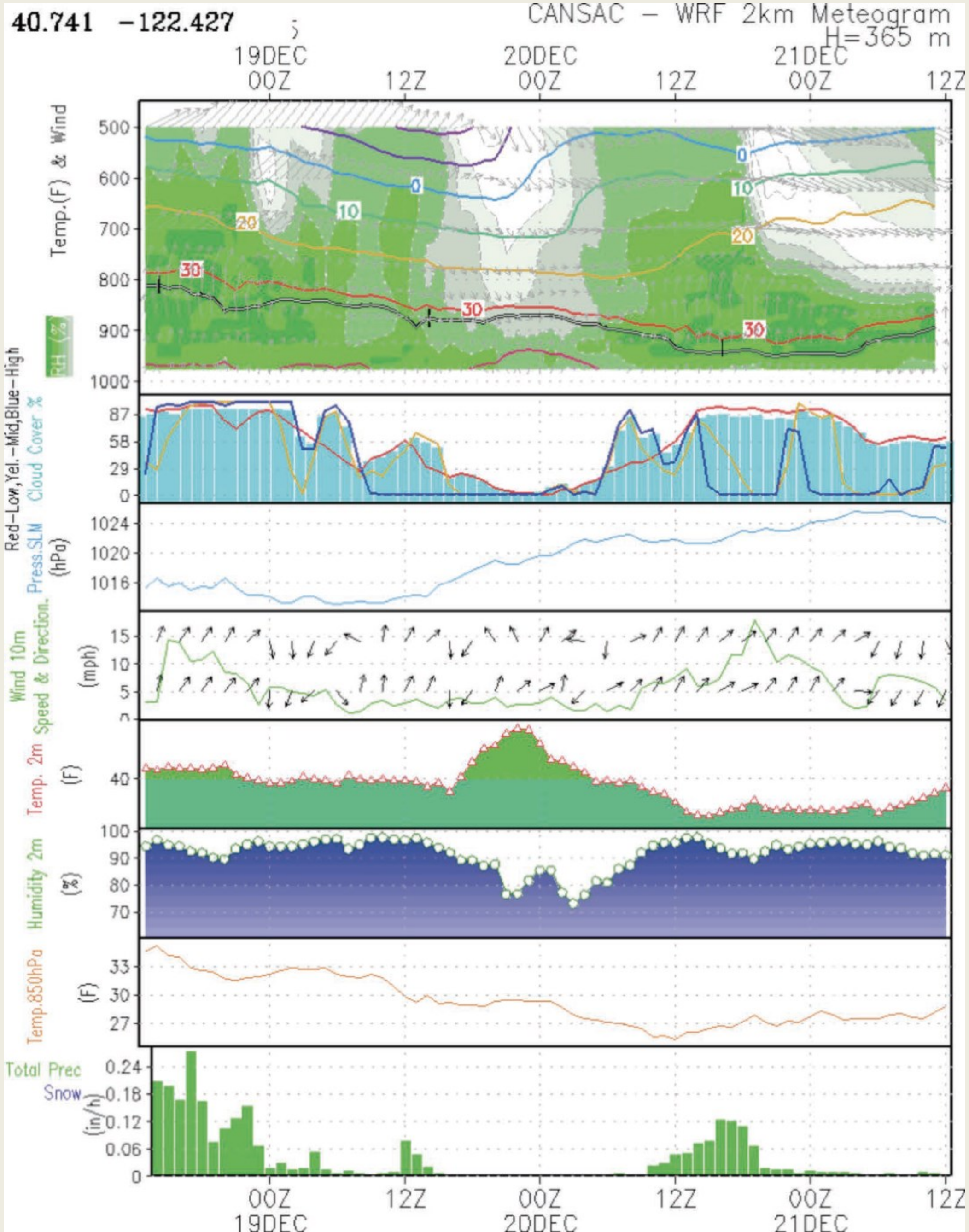
WRF 2 km Domain, Initialized 2019-03-16-12 UTC (16th, 0400 PST)

Product	Forecast Hours																									
Soundings | Meteograms | On-the-fly Soundings | On-the-fly Meteograms | Winds animation | | Bay Area | Monterey Bay | San Diego | SJV																										
SLP, 10m Winds	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (SW Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (NW Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (NE Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (SE Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (SJVAPCD)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (Yosemite)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (San Joaquin County)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (Southern Nevada)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (Western Nevada)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (Eastern Nevada)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed (Bay Area)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface 10m Wind Speed and RH (Bay Area)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface Temperature	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface Temp (SW Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface Temp (NW Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface Temp (NE Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface Temp (SE Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
3Kft Surface Temp Difference	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface Relative Humidity	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface RH (SW Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
Surface RH (NW Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	Screenshot		36	39	42	45	48	51	54	57	60	63	66	69	72
Surface RH (NE Quadrant)	Loop	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72

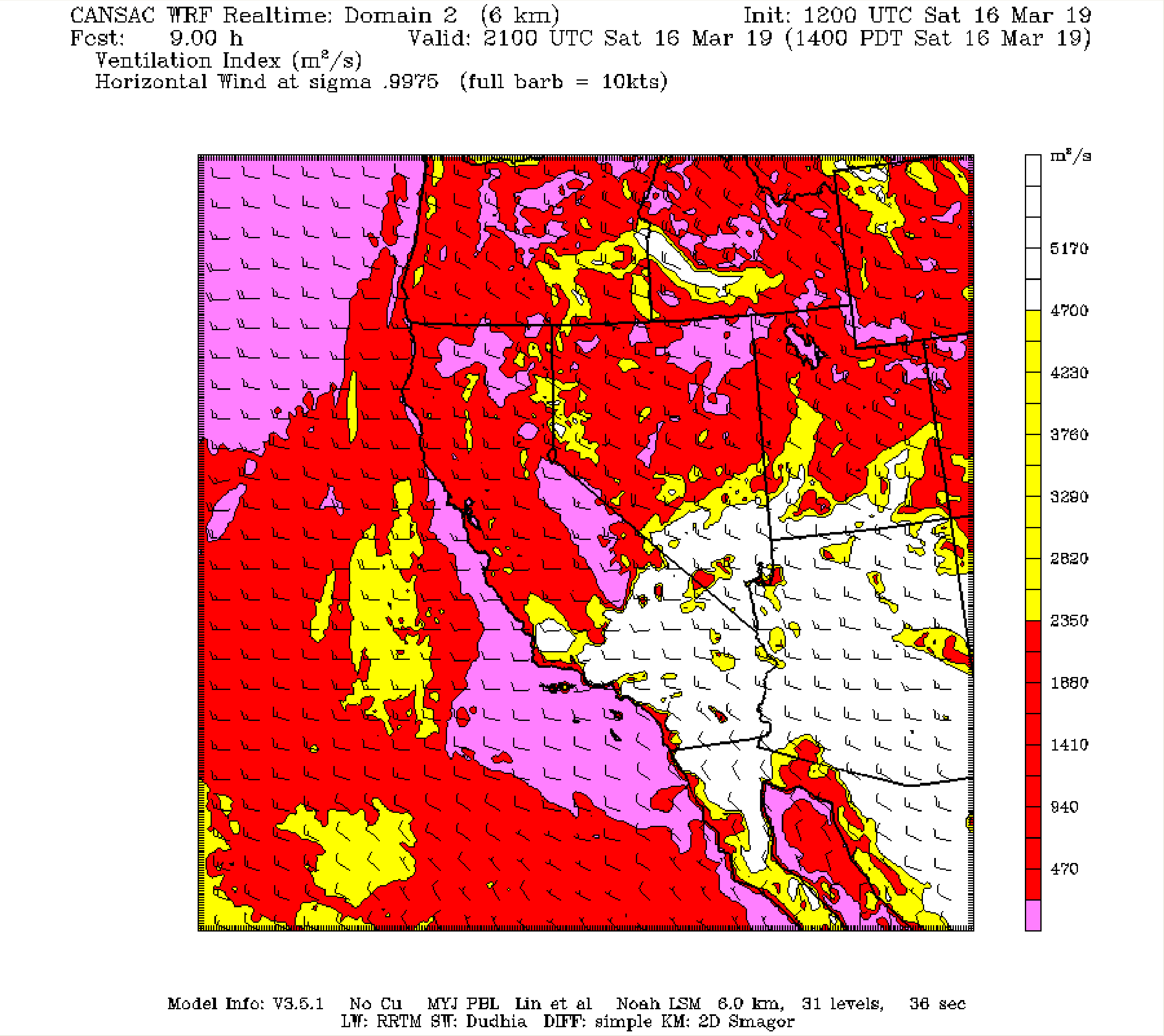
Example products



Example products



Example products



How CANSAC products are used

- High spatial resolution (2 km) graphics help meteorologists (Predictive Services, IMET, and Air Resource Advisors) identify small scale wind flows that can have adverse effects on fire spread and behavior
- High temporal resolution (3-hour) graphics help meteorologists determine more specific time frames of critical events such as cold frontal passages, gap wind intensification, thunderstorm development, and frontal band precipitation
- Graphics are currently being used in operational forecast products
- Graphics are shown during routine and specialized strategical and tactical briefings
- Graphics are used as guidance to help adjust incident and regional based smoke outlooks issued by ARA's as well as providing guidance to burn bosses on the daily 1300 smoke call.

How CANSAC products are used

- Courser data (6 km and 18 km) are used to identify large scale trends in weather and help identify potential critical fire weather and smoke atmospheric patterns
- Provides critical air quality forecasts and burn day decisions for California
- Provides operational fire weather forecasts for RX burning and wildfire. Supports GACC and ARA deployments
- Provides BlueSky smoke modeling
- Supports documentation of “Exceptional Events”
- Supports research related to smoke management, emissions including GHGs, public exposure, and climate
- Utilized as guidance product by several NWS Forecast Offices

CANSAC related research

10-year (2004-2013) hourly 2-km gridded CANSAC reanalysis dataset generated to provide climate and weather data in inform wildfire hazard mapping for the state of California (CPUC-HFTD)

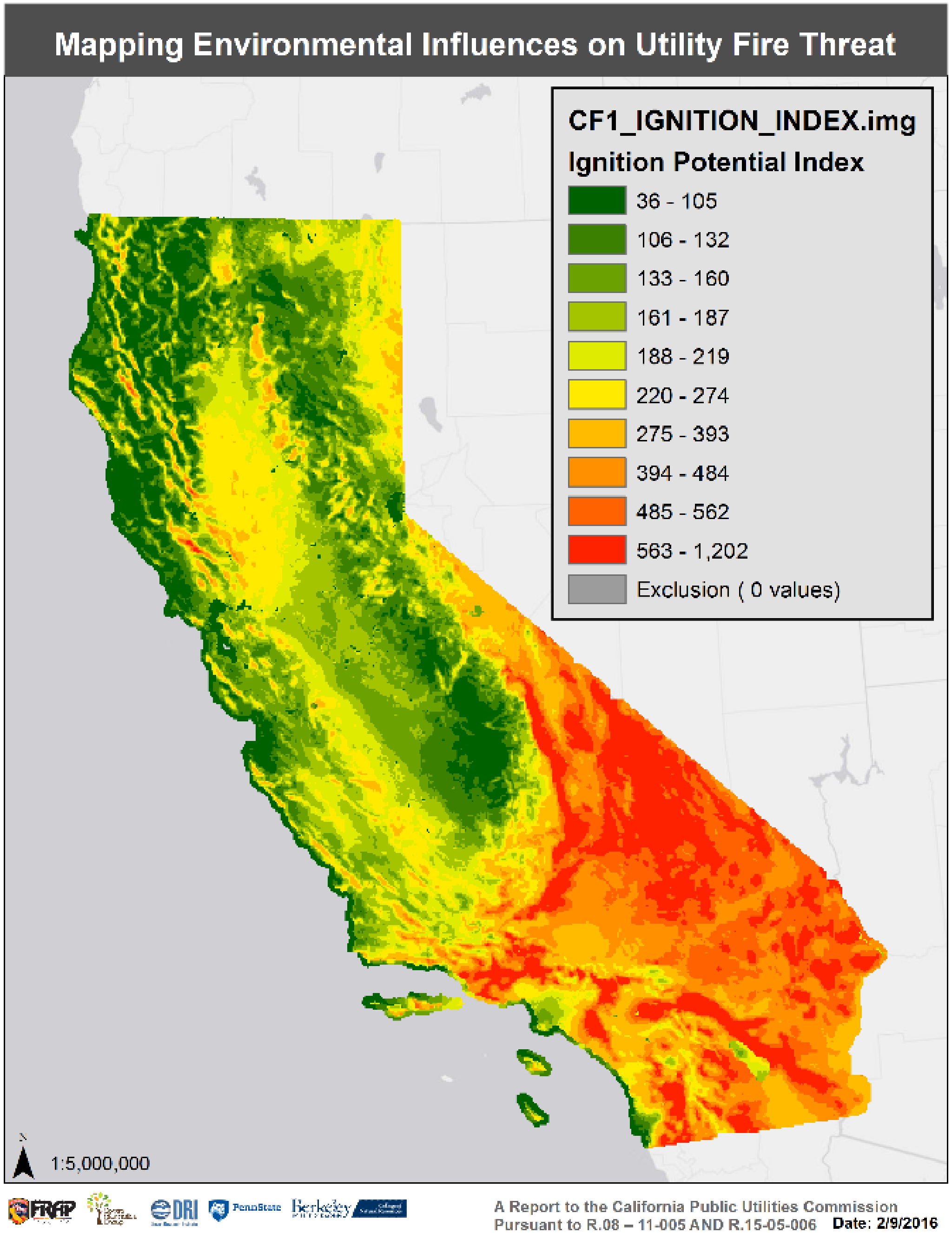
The WRF model was used to generate the temporally and spatially complete dataset, including surface and 32 atmospheric levels for the same domains as operational CANSAC

Current project is extending the dataset through 2018 and performing formal bias correction on surface fire weather elements (i.e., temperature, relative humidity, wind speed, and solar radiation)

Reanalysis will form the data used as localized critical fire weather conditions/probabilities on CAL FIRE FHSZ remap model – for both generalized wildland hazard and urban conflagration potential.

- $IPI = wind^2 * Schroeder's\ p(Ig)$

- Cell values based on top 2% of daily max FFWI



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