Supplement for

Identifying biomass burning impacts on air quality in Southeast Texas 26–29 August 2011 using satellites, models and surface data

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Additional Supporting Information (Files uploaded separately)

None

Introduction

This supporting information provides:

- 10 paragraphs of text describing data sources to be included as Supplementary material,
- one (1) figure to be included in Supplementary material and
- one (1) table to be included in Supplementary material.

Text S1.

7 Supplementary material

[42] Fires. Several Federal agencies maintain fire detection and mapping capabilities to aid in response to wild fires. These include NASA's Fire Information for Resource Management System (FIRMS, earthdata.nasa.gov/earth-observation-data/near-real-time/firms), NOAA's (National Oceanic and Atmospheric Administration) Hazard Mapping System (HMS, www.ospo.noaa.gov/Products/land/hms.html), and the U.S. Forest Service's MODIS Active Fire Mapping Program (activefiremaps.fs.fed.us/). These systems generally use satellite-detected thermal anomalies from instruments such as GOES and MODIS, automated algorithms such as the Wildfire Automated Biomass Burning Algorithm (WFABBA, wfabba.ssec.wisc.edu/) and Fire Identification Mapping and Monitoring Algorithm (FIMMA, www.ssd.noaa.gov/PS/FIRE/Layers/FIMMA/fimma.html) along with ground reports and

manual filtering to identify locations with a high probability of being surface fires. Figure SM-1 plots locations of likely fires identified by NOAA's HMS, 24-26Aug.

[43] NAAPS (Navy Aerosol Analysis and Prediction System, http://www.nrlmry.navy.mil/aerosol/). The Naval Research Laboratory (NRL) combines several aerosol forecast models to predict sulfate, dust, smoke and aerosols in the troposphere (http://alg.umbc.edu/usaq/archives/NAAPS_20090823.pdf and http://www.nrlmry.navy.mil/aerosol_web/Docs/globaer_model.html accessed 24Oct14) (*Christensen* 1997; *Hogan and Rosmond*, 1991; *Hogan and Brody*, 1993).

[44] HYSPLIT (NOAA's Hybrid Single Particle Lagrangian Integrated Trajectory model, ready.arl.noaa.gov/HYSPLIT.php). Backward HYSPLIT (*Draxler and Rolph*, 2014; *Rolph* 2014) single-parcel trajectories of 168 hours duration were used to evaluate sources of transported air the week prior to 26Aug. Trajectories were initialized at altitudes of 10 m, 50 m, 100 m and at 250 m increments from 250 m to 5 km from the Houston East monitor (29.7679965ºN, -95.2205822ºW) at 19:00Z on 26Aug using EDAS 40 km meteorology.

[45] BAMGOMAS (NASA's Back trajectories, AERONET, MODIS, GOCART, MPLNET Aerosol Synergism, aeronet.gsfc.nasa.gov/BAMGOMAS/index.html). BAMGOMAS trajectory model runs by Tom Kucsera are available from the AERONET (AErosol RObotic NETwork) site (aeronet.gsfc.nasa.gov/BAMGOMAS/). 168-hr backward trajectories were initialized at 12:00Z on 26Aug from the location of the AERONET instrument atop the Moody Tower at the University of Houston (29.718ºN, -95.333ºW) at pressure levels: 950, 850, 700, 500, 400, 300, 250 and 200 hPa.

[46] Geographic bin definitions. Satellite and model output was binned into the following geographic regions: HGB (29.0°N, -96.0°W, 30.5°N, -94.5°W), BPA (29.5°N, -94.5°W, 30.25°N, -93.5°W), LA/MS (29.0°N, -94.0°W, 33.0°N, -88.0°W)+(33.0°N, -91.0°W, 35.0°N, -88.0°W).

[47] AERONET. NASA Aerosol Robotic Network (aeronet.gsfc.nasa.gov/). AERONET (*Holben, et al*., 1998) is a global network of surface-based sun photometers that measure properties of atmospheric aerosols including aerosol optical depth (AOD by observing radiation from the sun. AOD is a measure of transparency due to light scattering by particles in a column. More particles mean more scattering and less light detected by the sun photometer. The University of Houston deploys an AERONET instrument atop the Moody Tower on its main campus. AERONET uses a spectral deconvolution algorithm (SDA) in the 500 nm wavelength developed by O'Neill (2003) to convert raw detected radiances into AOD. SDA facilitates differentiation of AOD between coarse and fine mode particles which can be used to identify likely sources of aerosols. Coarse mode particles are generally considered to be airborne dust and soil whereas fine mode particles are more likely the result of fossil fuel combustion or BB (*Seinfeld and Pandis*, 1998).

[48] MODIS. NASA MODerate resolution Imaging Spectroradiometers (ladsweb.nascom.nasa.gov/index.html) (*Remer et al*., 2006) aboard both Terra and Aqua platforms report level 2 (geo-referenced, cloud-cleared, quality-assured), 3-km resolution retrievals. Data used: Granules overlapping in whole or in part a bounding box defined by [25°N, -100°W; 45°N, -80°W]: MOD04_L2_3K_2011231-gggg through

MOD04_L2_3K_2011243-gggg and MYD04_L2_3K_2011231-gggg through MYD04_L2_3K_2011243-gggg where ‘gggg’ indicates granule number.

[49] AIRS. NASA Atmospheric Infrared Sounder (airs.jpl.nasa.gov/data/overview) (*Barnet et al*., 2007) aboard the Aqua platform retrieves CO and meteorological parameters. Data used: Level 2 retrievals AIRS.2011.08.dd.ggg.L2.RetStd_IR.v6.0.7.0.Gxxxxxxxxxxx where ‘dd’ is day (19-31), ‘ggg’ is granule overlapping in whole or in part a bounding box defined by [25°N, -100°W; 45°N, -80°W] and ‘xxxxxxxxxxx’ is a unique production time stamp.

[50] CALIOP. NASA Cloud-Aerosol Lidar with Orthogonal Polarization aboard CALIPSO (Cloud-Aerosol Lidar Infrared Pathfinder Satellite Observations) (*Hostetler et al*., 2006). Data used: Feature classification flags and vertical feature masks from CAL_LID_L2_VFM-ValStage1-V3-01.2011-08-26T19-14-29ZD.

[51] TES. NASA Tropospheric Emission Spectrometer (subset.larc.nasa.gov/tes/login.php) (*Beer et al*., 1999) aboard the Terra platform. There were no valid retrievals from the TES instrument aboard Aura over southeast TX during the period of interest.

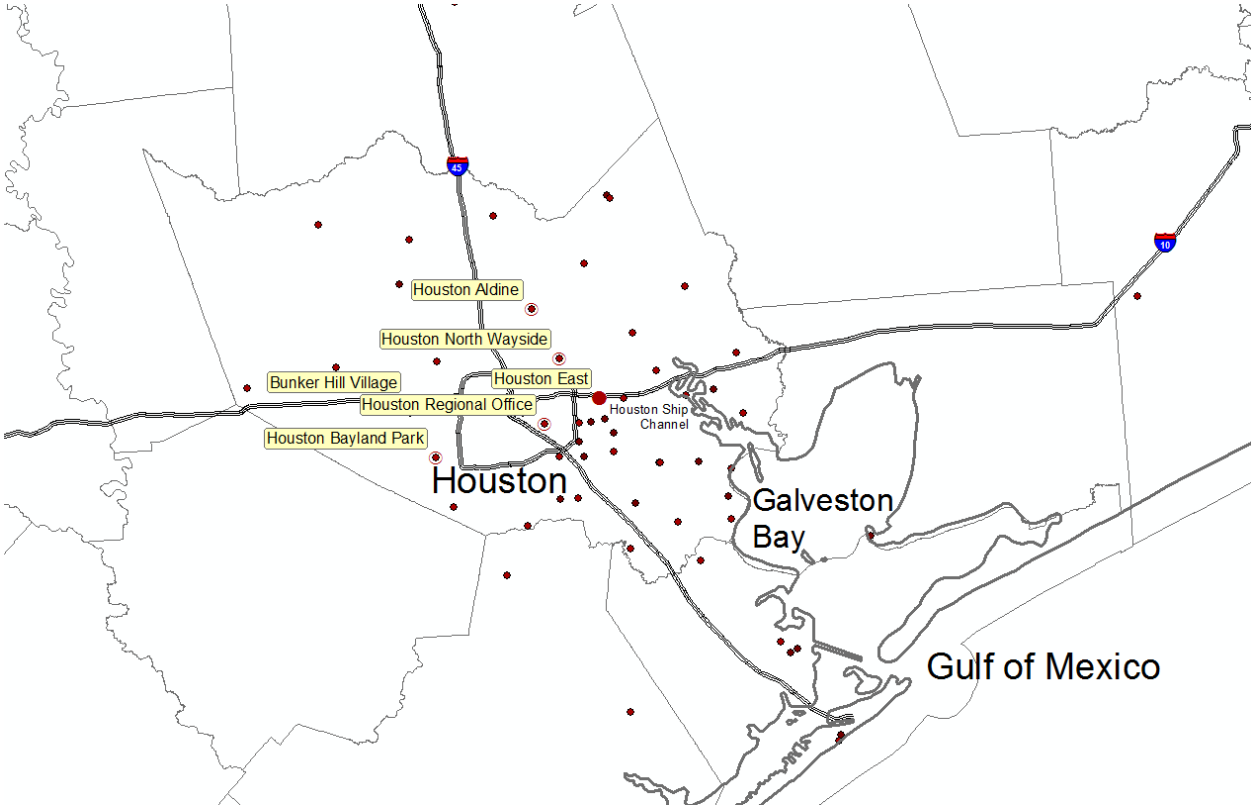

Figure SM-1. Locations of surface monitors in the HGB area and southeast Texas.

Table SM-1. Satellites

Instrument	Platform	Overpass time	Reference paper	Relevant parameter(s)

MODIS	Aqua & Terra	~10:30 LST & ~13:30 LST	*Remer et al*. (2006)	AOD
GOES	GOES	every 30 min.	*Knapp et al. (*2004) *Prados et al*. (2007)	AOD
CALIOP	CALIPSO	~13:30 LST	*Hostetler et al*. (2006)	aerosols, smoke
AIRS	Aqua	~13:30 LST	*Barnet et al*. (2007)	CO
MOPITT	Terra	~10:30 LST	(*Gille, et al.*, 1996)	CO