

Air Quality Modeling from the Offshore Energy Sector in the Gulf of Mexico: An Overview for the Oil and Gas Industry

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***Presented at
American Meteorological Society 2014 Annual Meeting
February 4, 2014***



BOEM

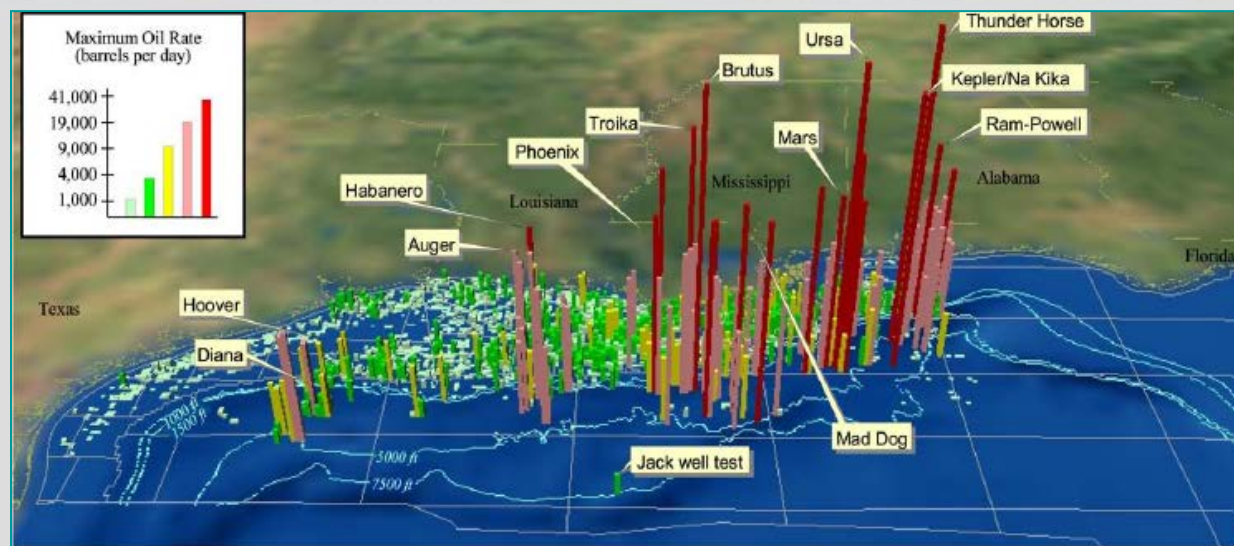
- Bureau of the U.S. Department of the Interior: Atlantic, Gulf of Mexico, Pacific and Alaska Outer Continental Shelf (OCS) regions.
- Manages the minerals and renewable energy resources of the OCS.
- Federal and State guidelines include the Outer Continental Shelf Lands Act as amended (OCSLA), Submerged Lands Act, Oil Pollution Act of 1990, and Energy Policy Act of 2005.



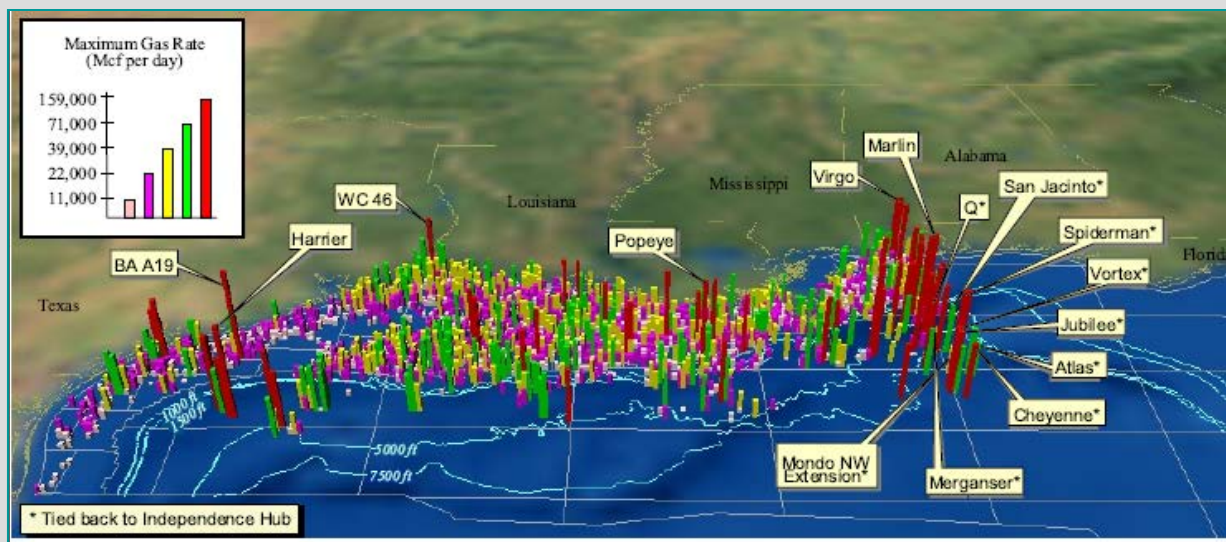
- In the wake of the *Deepwater Horizon* explosion, oil spill and response, new safeguards to protect the environment.
- Develops the Five-Year OCS Oil & Natural Gas Leasing Program.



**The Gulf of Mexico
OCS Provides about
24% of the U.S.
Domestically
Produced Oil**



On a daily base BOEM manage about 6,000 leases, 32 million acres leased, 3,400 production platforms, and over 150 designated operating companies.



**The Gulf of Mexico OCS
Provides about
8% of the U.S.
Domestically Produced
Natural Gas**

(WPA 238, 246, 248, Nov-2013)



BOEM: Post-lease Activities and Studies

Reviews are performed on exploration plans, development plans, pipeline applications, geological and geophysical applications, and structure-removal applications. The reviews are focus on:

- Air Quality
- Protected Species
- Topographic/Biological Features
- Chemosynthetic Communities
- Submerged Cultural Resources
- Coastal Zone Management
- Oil Spills



Environmental Studies Program (ESP)
Biological, physical, and socioeconomic research for Gulf of Mexico: >100 active studies ongoing; >300 studies completed; >\$47 million in active studies.



BSEE: Inspection and Enforcement

Part of major reorganization of the Department of the Interior's offshore regulatory structure to compel

- Safety in offshore activities
- Oil spill response preparation to ensure compliance with regulations
- Environmental enforcement
- Funding scientific research



Conducts investigations and prepare public reports of incidents.

From Jan-Mar, 2012:

TYPE OF INSPECTION	INSPECTIONS PERFORMED
Well Operations	255
Production	575
Pipelines	677
Meters	885
Environmental	585
Other	611
Quarterly Total	3,588

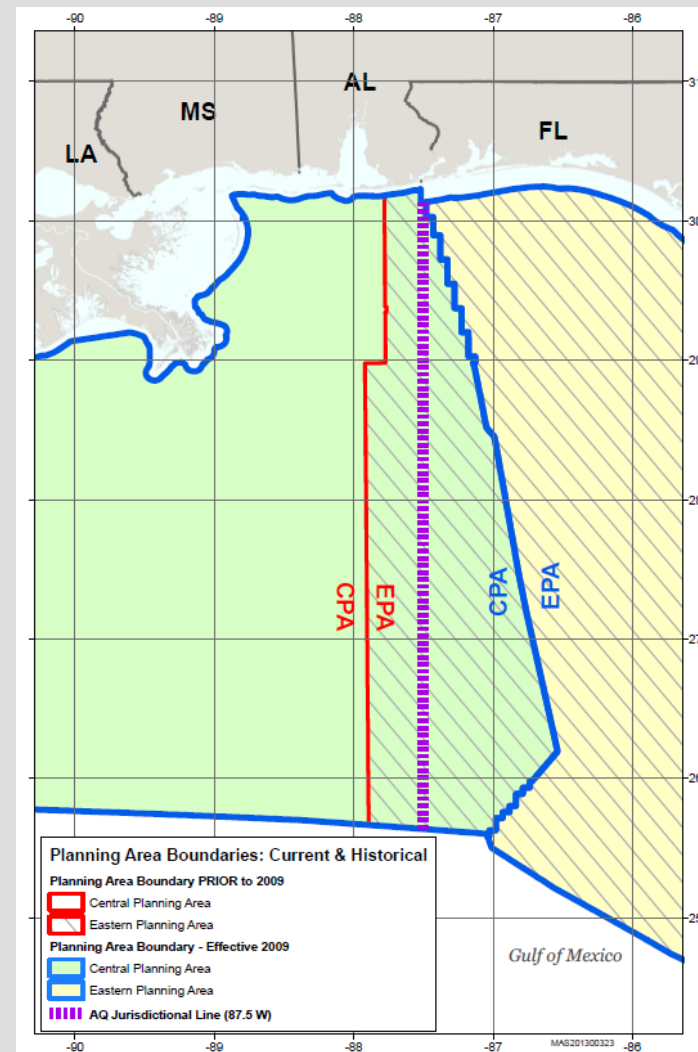
Investigation reports publish findings regarding the cause(s) of the accident and identify potential topics for Safety Alerts.

BSEE, Enforcement Newsletter, Vol.1 (2), 2012



Air Quality Regulation: BOEM vs. U.S. EPA

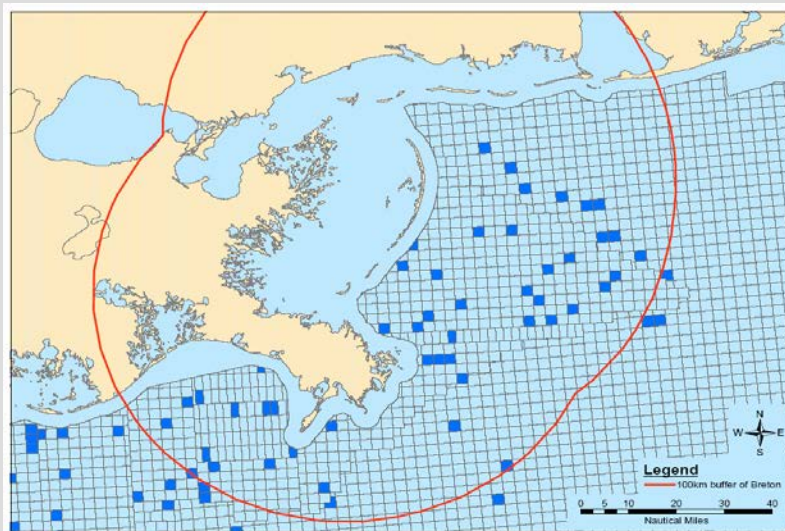
- Under the Clean Air Act, the U.S. Environmental Protection Agency is required to set the National Ambient Air Quality Standards; and to periodically review the science and standards.
- U.S. EPA has jurisdiction in the Eastern Planning Area and part of the Central Planning Area of the Gulf of Mexico.
- BOEM has jurisdiction in the Western & Central Planning Areas of the Gulf of Mexico.
- Under the OCSLA, BOEM is required to comply with the NAAQS so that offshore OCS activities do not significantly impact the air quality of any State.



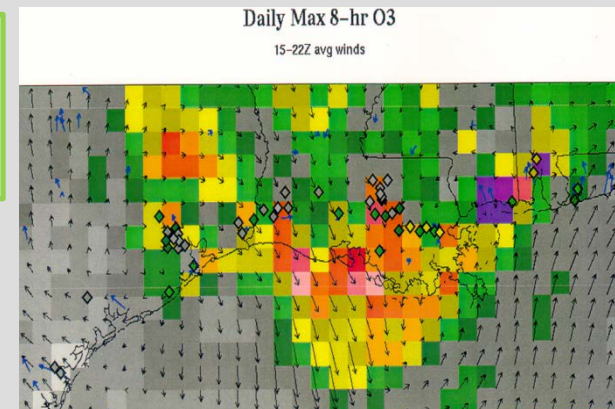
Air Quality: Inventories, Modeling, Monitoring

The ESP develops, conducts, and oversees scientific research specifically to inform policy decisions regarding expansions of OCS resources.

Several studies on meteorology and AQ modeling. Ongoing efforts to update AQ modeling capabilities following U.S. EPA plans (data, new O&G industry reports)



- Gulfwide Emissions Inventory: 2005, 2008, 2011, 2014 (in progress)
- Breton National Wildlife Area: Emissions Inventory of OCS Production Activities



2013 Meteorological and Wave Measurements for Improving Meteorological and AQ Modeling



AQ Case Study

Upgrading Air Quality Modeling in the Gulf of Mexico: Integrating Local and Remote Emissions with Photochemical Models

- BOEM needs to address the impact of air pollutant emissions from Oil and Gas sources.
- Only local sources of pollutants have been considered in historical reviews.
- External sources also have a serious impact on regional AQ and are beyond regulatory control (Bozlaker et al., 2013).

- An integration of advanced AQ models with combined locally and externally transported emissions is needed to
- comprehend atmospheric processes and appropriately address AQ concerns
 - objectively answer Federal and State requests on environmental impact matters.

Meteorology

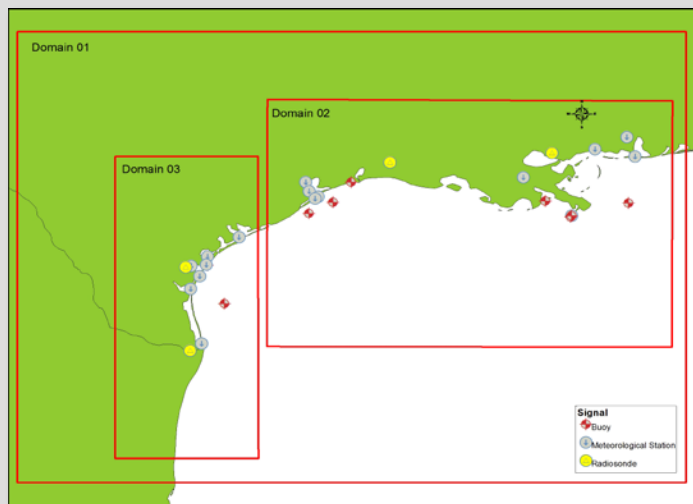
- Data: model, in-situ obs. and satellite
- Sensitivity to Planetary Boundary Layer (PBL) physics

Evaluation of Photochemical Models
WRF-Chem and CMAQ



Sensitivity to PBL Physics in Photochemical Models (in progress)

- Photochemical models offer improved options and larger spatial scales to better answer concerns of how to mitigate adverse situations of AQ or to devise short or long term strategies.
- The marine boundary layer processes in coastal areas are complex to represent and pose a challenge in accurately determining the dispersion of contaminants in sensible environments and urban settlements.



WRF configuration included Yonsei (YSU), Mellor-Yamada (MY), and Total Mass Flux (TEMF) planetary boundary layer options along with Kain-Fritsch (cumulus), Pleim-Xiu (land surface), Pleim-Xiu (surface layer), Dudhia (shortwave rad), GFDL (longwave rad), and Lin et al. (microphysics).

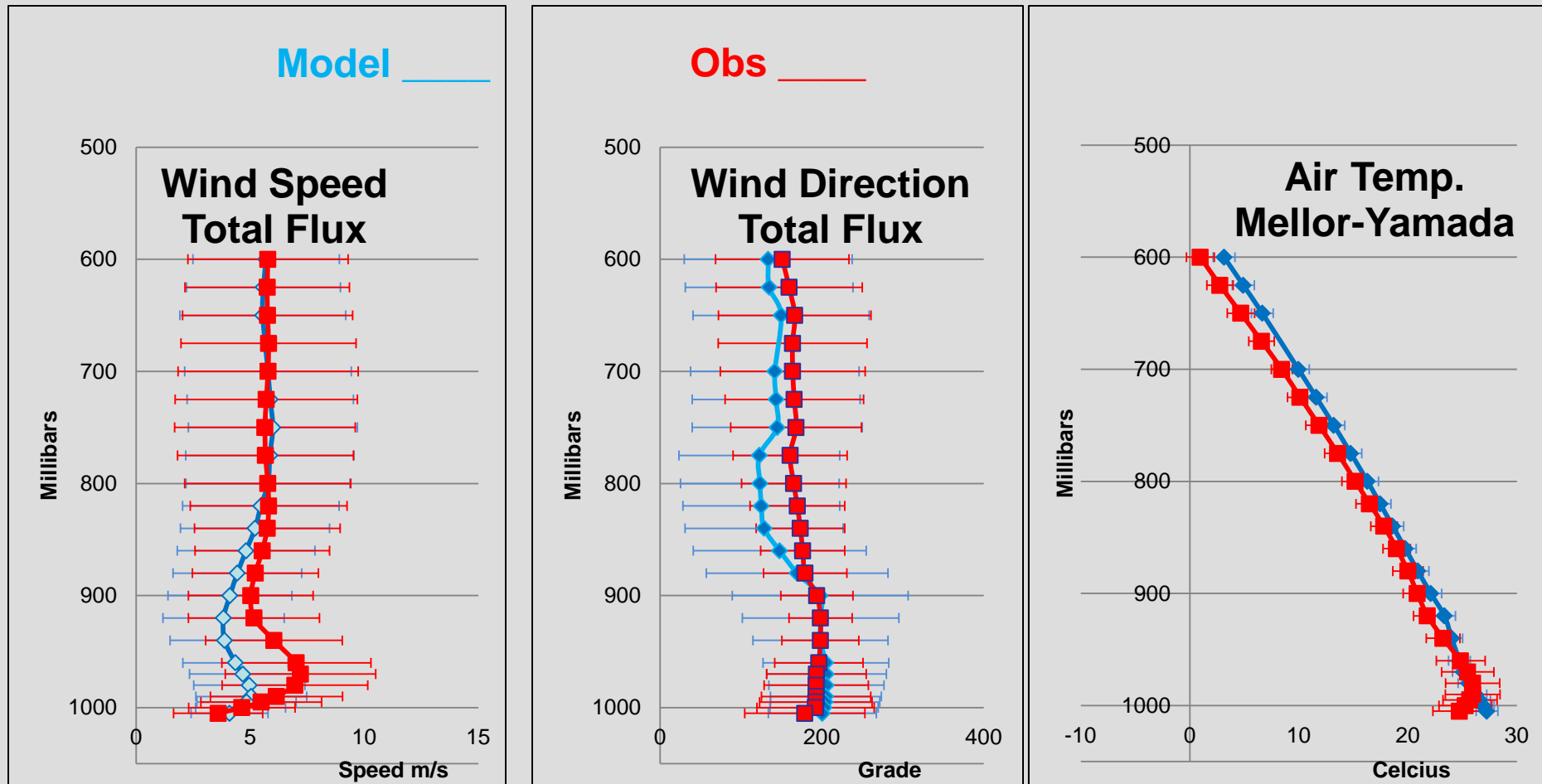
Meteorological stations, buoys, and IGRA radiosonde data are used to evaluate simulations at three domains of 12 km and 4 km over the Gulf of Mexico in summer 2006.

C. A. Pérez, poster 264



Atmosphere

WRF :vs: Rds.72233: August 2006, 12 UTC



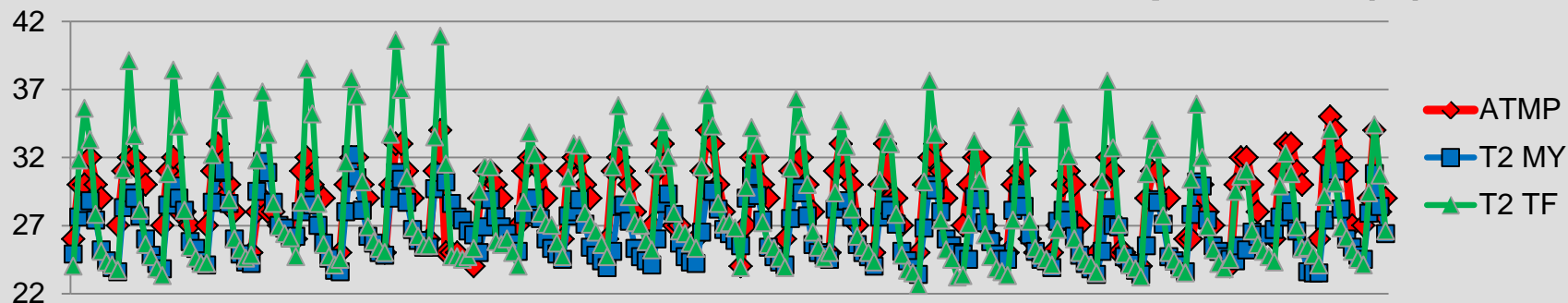
WRF shows reasonable representation at the lower atmosphere for wind speed and direction, and air temperature.



Surface data

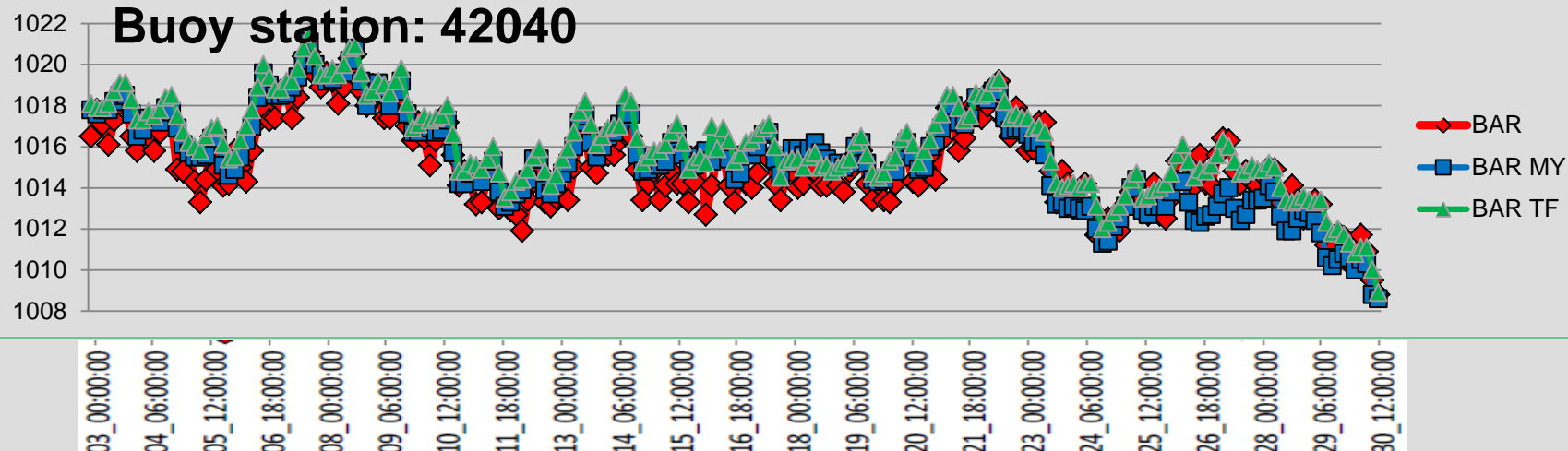
Meteorology: station 13820

Air Temperature (C)



Pressure (mbar) at Surface

Buoy station: 42040



WRF have a good performance at the surface level for temperature and pressure.



Thank you !

