

Introduction

The Metropolitan Area of Sao Paulo (MASP) is the main urban center of South America, occupying the sixth position among the largest in the world. It has about 21 million inhabitants spread over an area of 7,947 km². As effect of urbanization, complex interactions with atmospheric mesoscale circulations can influence local circulation patterns and air quality. The mobile source is responsible by the emissions of gaseous and particles involved in the formation of secondary pollutants, as O₃ and PM_{2.5} that present concentrations above the air quality standards. The representation of the micro- scale processes in the mesoscale models is a challenge due to the inhomogeneity of the surface and local characteristics of each urban area in the world.



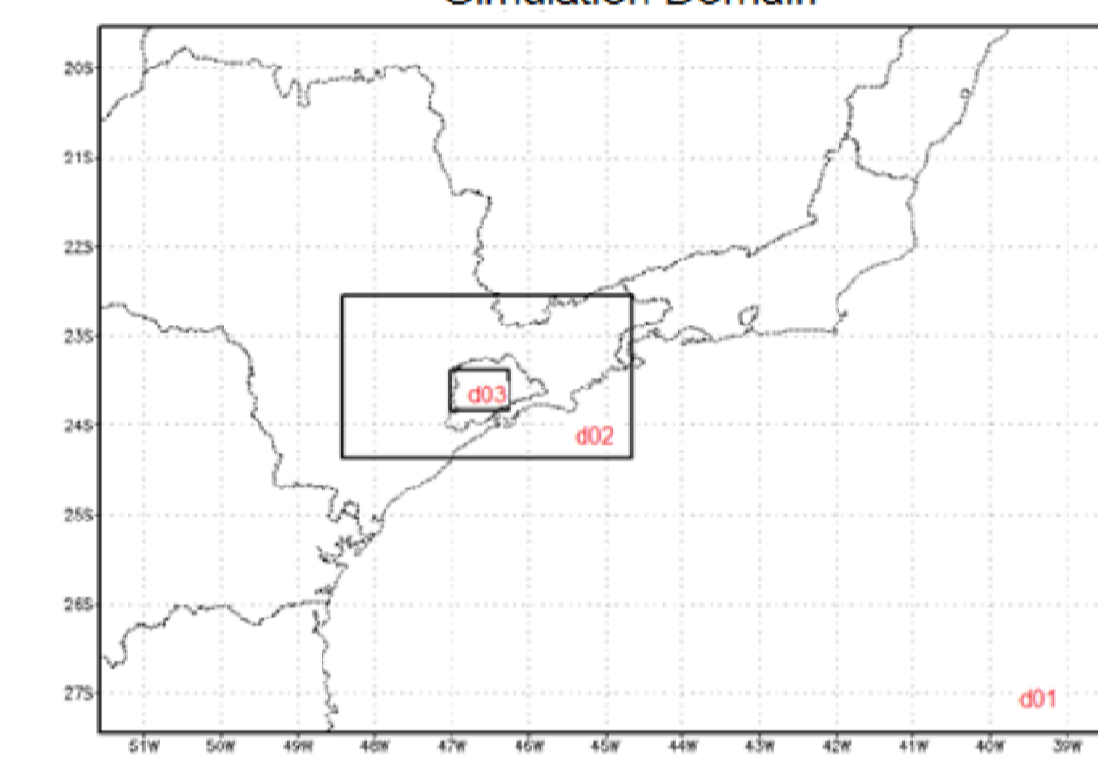
Methodology

Simulations were generated to MASP through the WRF model considering three nested grids with 16, 4 and 1 km of resolution, centered at lat 23°33'S and long 45°W englobing an area of 78 x 51 km (finer grid).

It was considered three urban surface parameterizations: default; single-layer (UCM) and multi-layer Building Environment Parameterization (BEP). Concerning the Planetary Boundary Layer Scheme (PBL), it was used BouLac parameterization. For the simulation with UCM it was considered three urban land use: commercial, high intensity residential and low intensity residential. For the

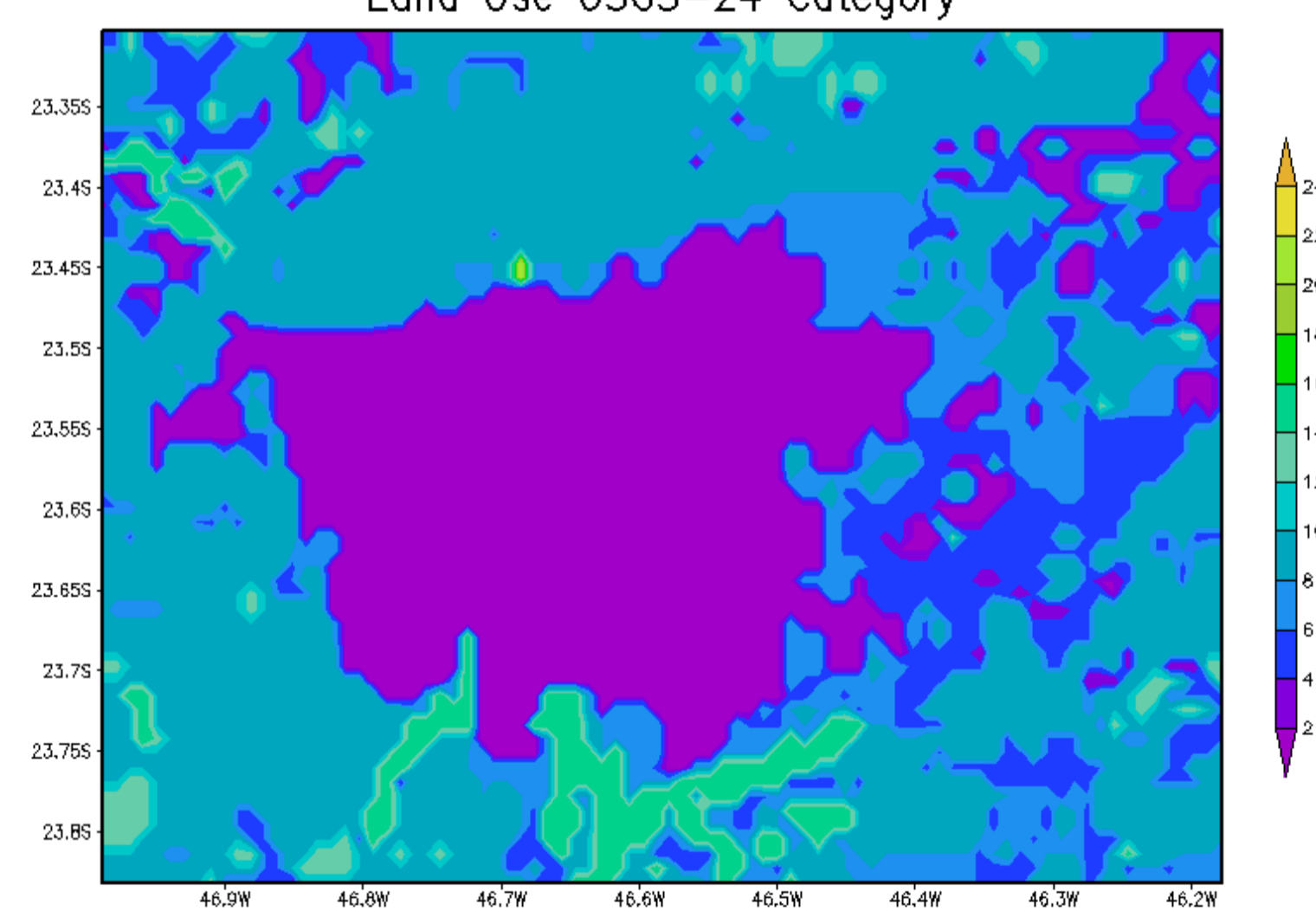
simulation with BEP, it was considered then built types of Local Climate Zone (LCZ) classification based on Stewart & Oke, obtained through Google Earth and Saga images as acquisition data strategy level "0" of WUDAPT (World Urban Database and Access Portal Tools).

Simulation Domain

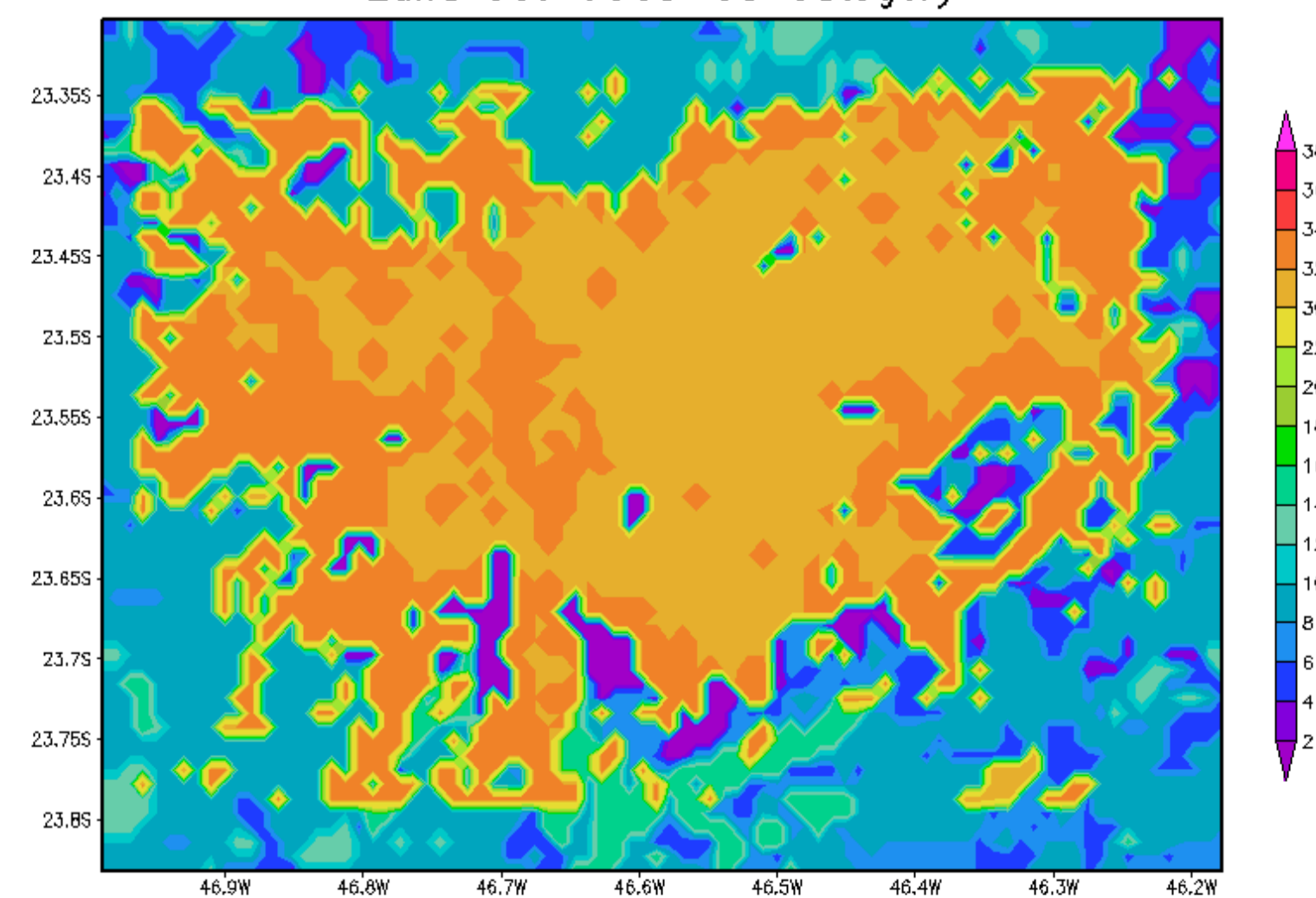


Physics Options	Type	Scheme
Microphysics	2	Lin (Purdue)
Long Wave Radiation	4	RRTMG
Short Wave Radiation	4	RRTMG
Surface Layer	2	Monin-Obukhov (Janjic Eta)
Land Surface	2	Noah
Planetary Boundary Layer	8	BouLac
	0	default
Urban Surface	1	UCM
	2	BEP

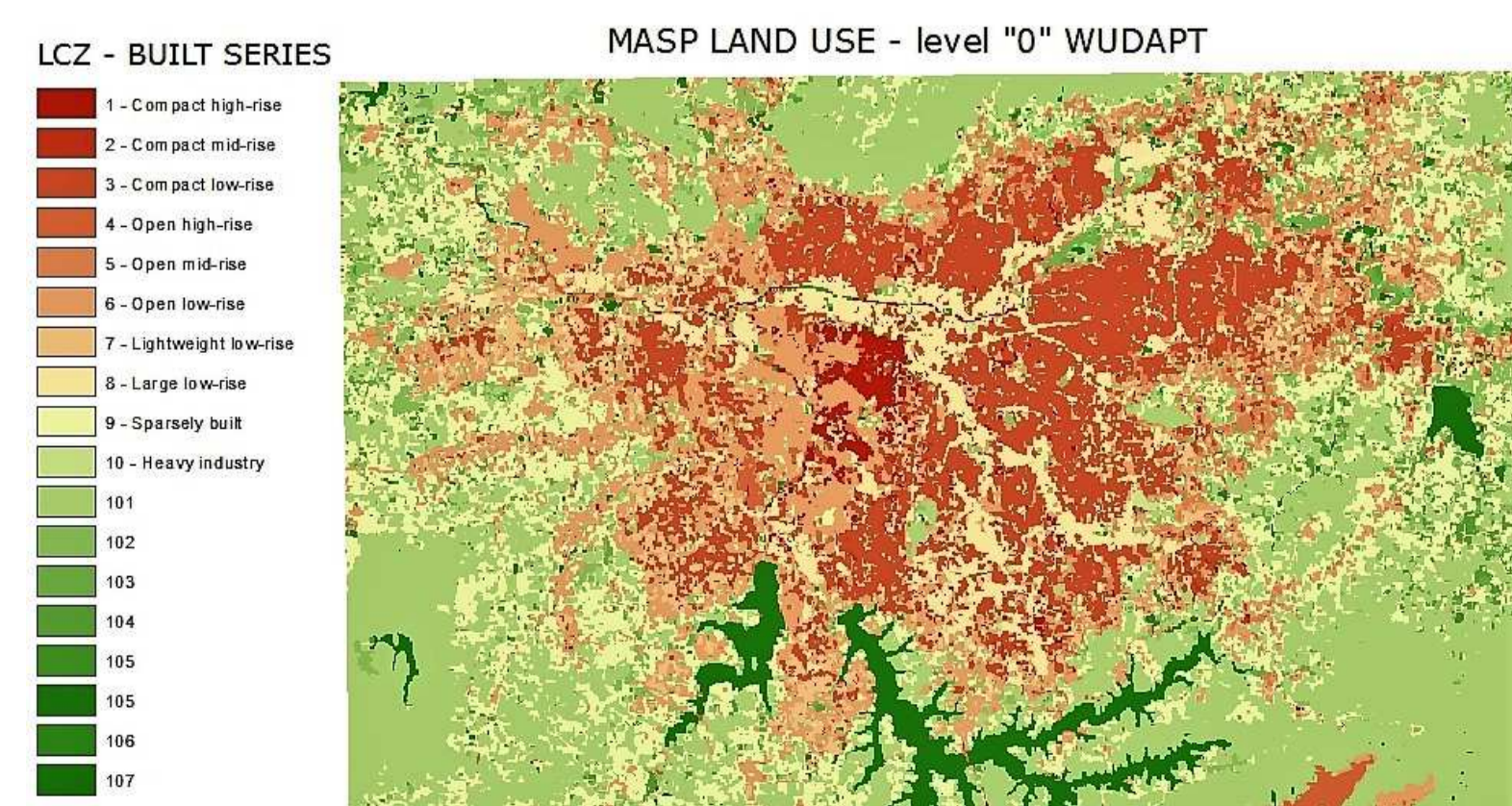
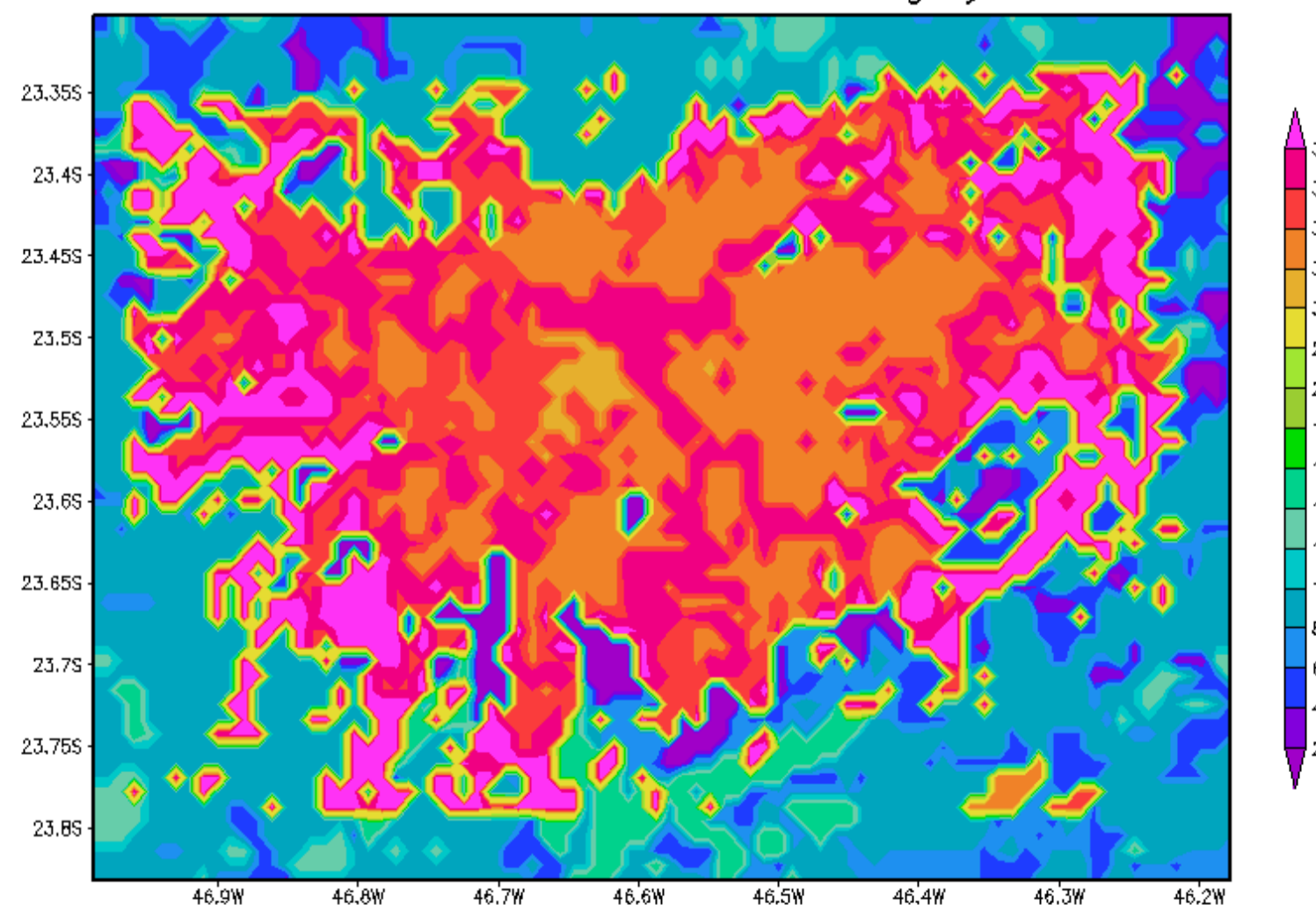
Land Use USGS-24 Category



Land Use USGS-33 Category



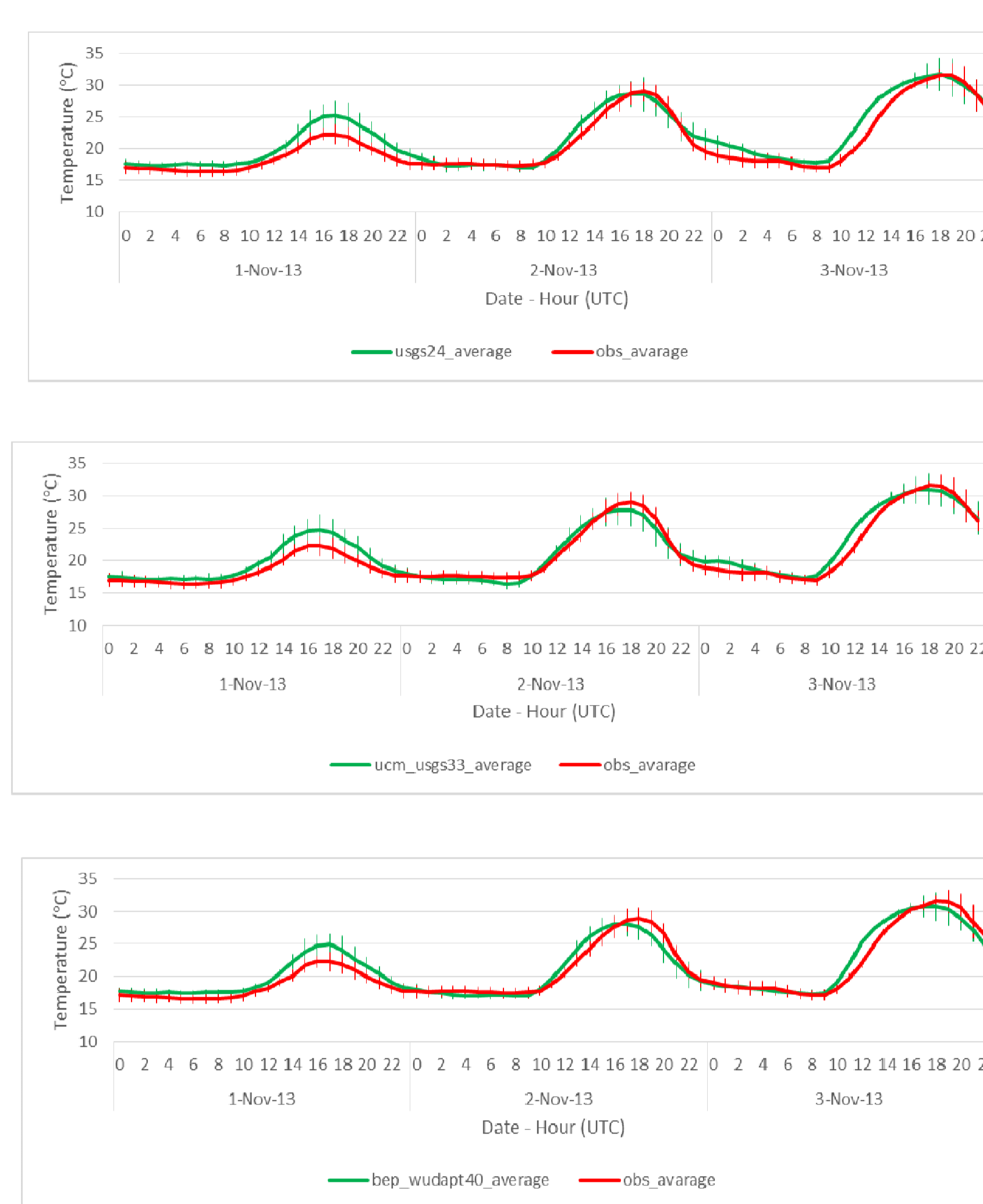
Land Use WUDAPT-40 Category



Results are compared with averages data measured at air quality stations of the Sao Paulo Environmental Agency (CETESB) and with meteorological soundings obtained at IAG/USP.

Results

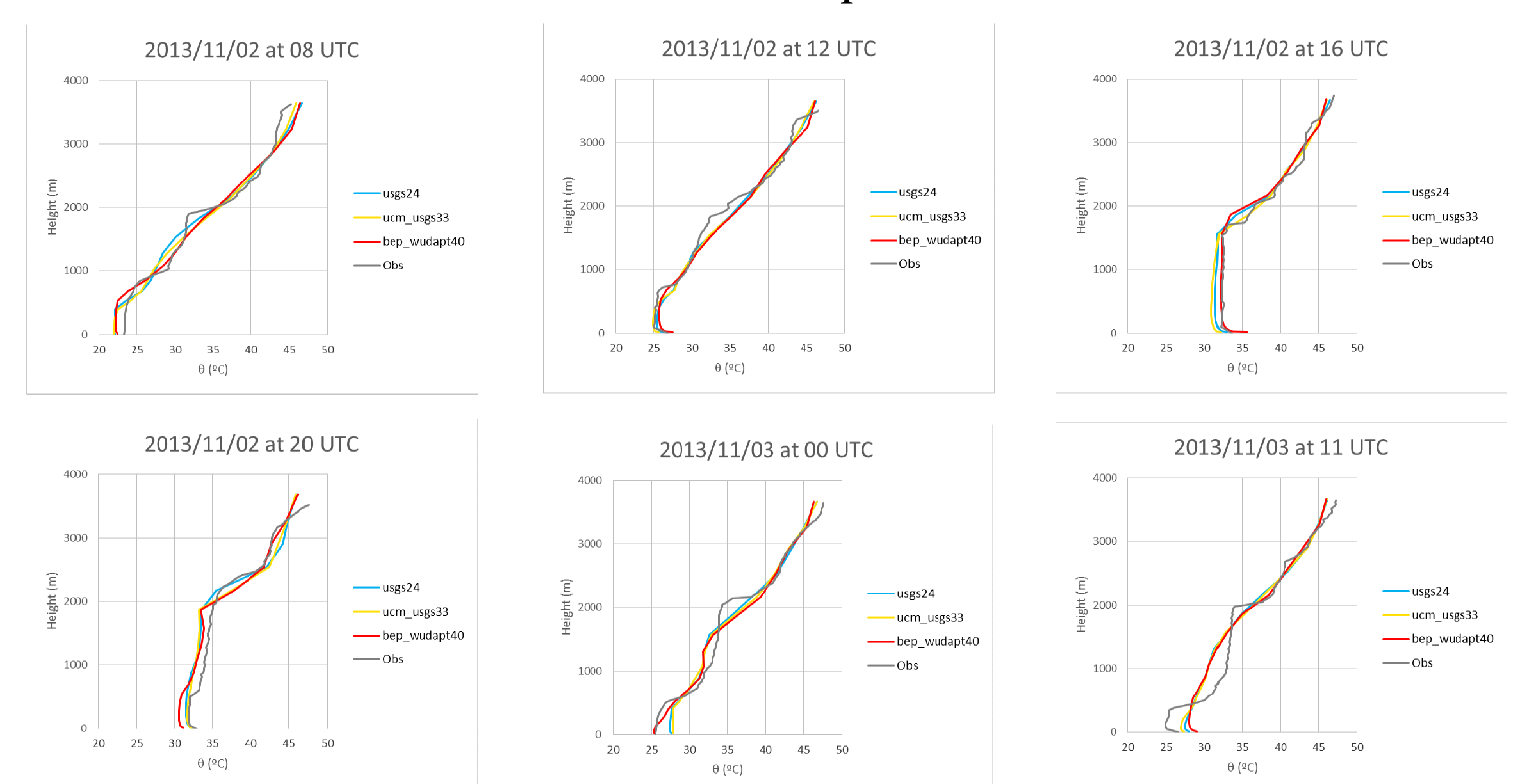
Surface Temperature



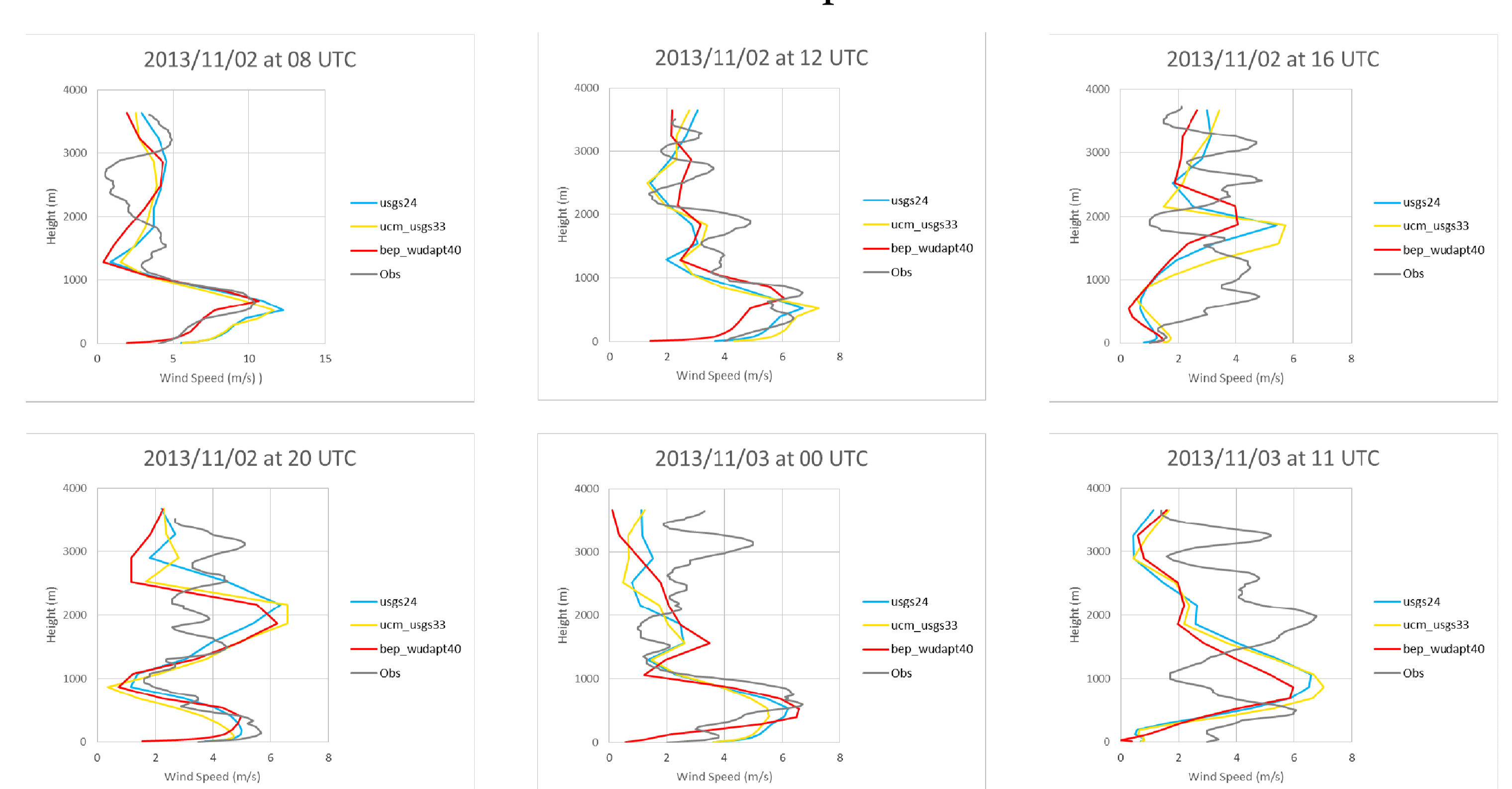
Wind Speed



Vertical Potential Temperature Profile



Vertical Wind Speed Profile



Conclusion

Simulations with the three parameterizations present results consistent with the observed data. Simulations with BEP_WUDAPT parameterization generated weaker surface wind speeds and closer to those observed than the other parameterizations. These results are quite encouraging since mesoscale models for estimating air quality, such as WRF-Chem, generally overestimate surface wind speed in the MASP.