

# Assimilating Satellite-Derived Snow Cover and Albedo Data to Improve 3-D Weather and Photochemical Models

**Table S1.** Summary of WRF model modifications.

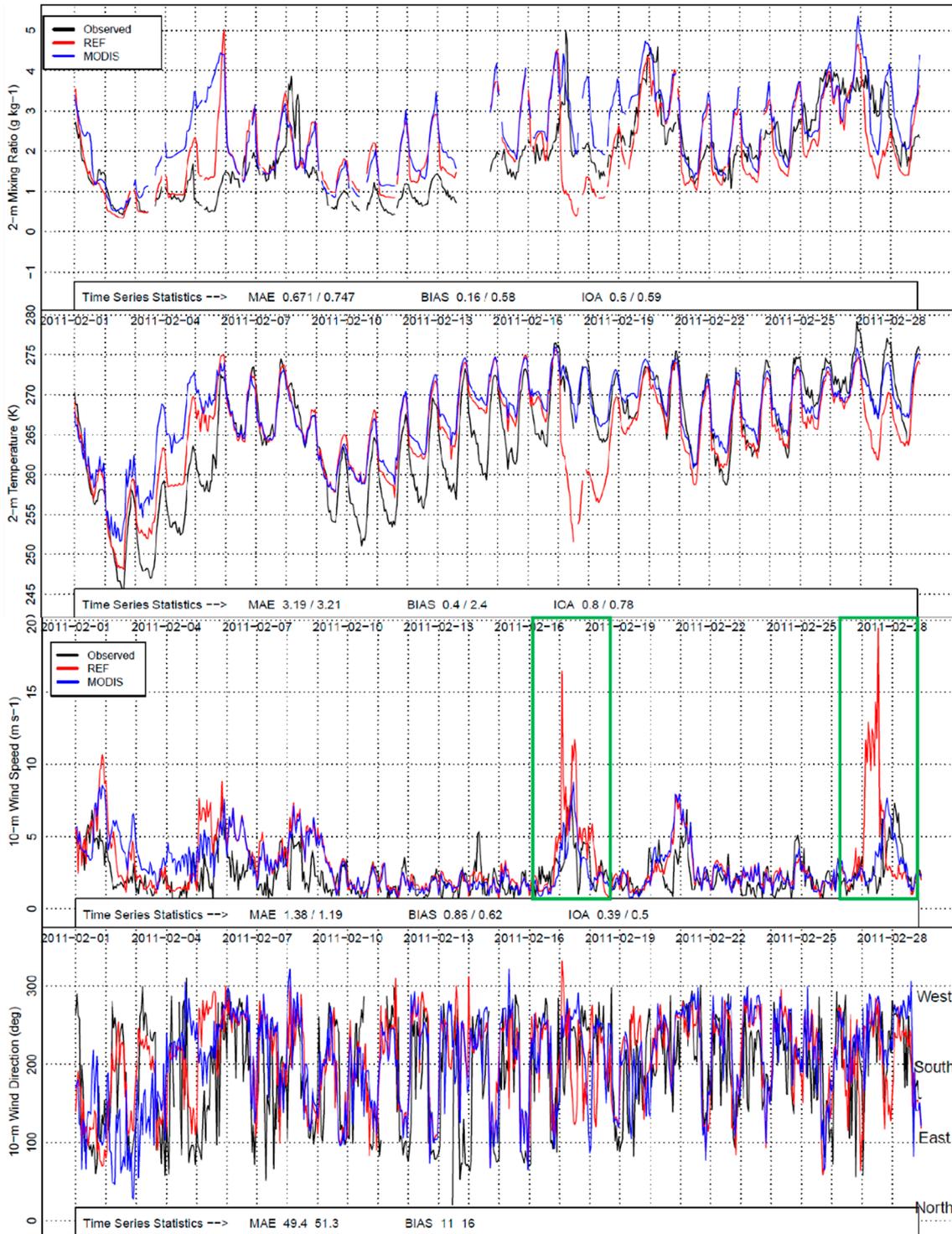
Module	Parameters	Descriptions
\$WRF_HOME/Registry/Registry.EM_COM-MON	SW_ALB_OLD, SW_ALB_NEW, SNOWC_OLD, SNOWC_NEW	New variables represent albedo (SW_ALB) and snow cover (SNOWC) added to <i>wrfsfdda_d&lt;domain&gt;</i> input files that will be read in by WRF during simulation. Frequency of data assimilation is controlled by variable <i>sgfdda_interval_m</i> . NEW and OLD represent values at the current and preceding hours, respectively.
\$WRF_HOME /Registry/Registry.EM_COM-MON \$WRF_HOME /phys/module_physics_init.F	galb_sfc, gsnc_sfcequal 0)	New variables added to WRF <i>namelist.input</i> to disable (values equal 0) or enable (values equal 1) albedo and snow cover assimilation
\$WRF_HOME /phys/module_fdda_psufddagd.F \$WRF_HOME /phys/module_fddagd_driver.F	ALBEDO, SNOWC	Add ALBEDO and SNOWC as the two additional variables that are processed in fdda nudging process
\$WRF_HOME /share/output_wrf.F	nl_get_galb_sfc, nl_get_gsnc_sfc	Add two new subroutines to assimilate albedo and snow cover from MODIS data.
\$WRF_HOME /dyn_em/module_first_rk_step_part1.F	ALBEDO, SNOWC, sw_alb_old, sw_alb_new, snowc_old, snowc_new	Declare new variables and method to calculating them

\$WRF\_HOME is the top level directory of WRF model.

**Table S2.** Summary of CAMx model modifications.

Module	Parameters	Descriptions
Module wrfcamx.f90	inalb, insnc, inlai	Add variables to read from wrf output files and process for CAMx binary input files.
\$CAMX_HOME/Includes/camxfld.inc In \$CAMX_HOME/CAMx: CAMx.f, getaldebo.f, startup.f, tstep_init.f	inalb, insnc, inlai, lrdmod	Add new variables represent albedo ( <i>inalb</i> ), snow cover ( <i>insnc</i> ) and leaf area index ( <i>inlai</i> ) that were processed by <i>wrfcamx</i> module.
\$CAMX_HOME/Mod_src/ camxfld.f	inalb, insnc, inlai, lrdmod	Allocate memory for the new variables
In \$CAMX_HOME/IO_bin: readinp.f, metinit.f		Add new code lines that read and store values of ALBEDO, SNOWCOVER and LAI from CAMx input binary files

\$CAMX\_HOME is the top level directory of CAMx model.



**Figure S1.** Comparison of the overall performance of WRF using the WRF default configuration (REF) and MODIS data assimilation (MODIS). Observed values are also shown. The panels show water vapor mixing ratio, temperature at 2 m above ground, wind speed at 10 m, and wind direction at 10 m (in descending order). Skill scores are shown at the bottom of each boxplot (REF/MODIS; see text for an explanation of scores). The green boxes indicate the days when storm fronts passed through the Basin.