Modeling Domain Selection and Configuration

Utah Division of Air Quality

Photochemical Modeling Domain Selection

A two-way nested modeling domain with respective horizontal grid spacing of 4 km (180 rows x 186 columns) and 1.33 km (201 rows x 90 columns) for the outer and inner domains was considered in all simulations (Figure 1). This configuration was selected to allow for an improved characterization of the local terrain and transport processes. The coarser-resolution 4 km domain encompasses the entire state of Utah, a significant portion of Eastern Nevada as well as smaller portions of Idaho, Wyoming, Colorado and Arizona while the finer-resolution 1.33 km domain covers the Provo, Salt Lake and Logan non-attainment areas. The fine domain extends from southern Franklin County, Idaho to the North to Utah County, Utah to the South. It also covers the eastern portion of the Great Salt Lake to the West and extends into the upper elevation areas of the Wasatch Front mountain range to the East. A total of 41 vertical layers was considered for both grid domains. A Lambert Conformal Conic (LCC) projection centered on 40N and 97W was also used for both horizontal modeling domains. A detailed list of the projection parameters is shown in Table 1.

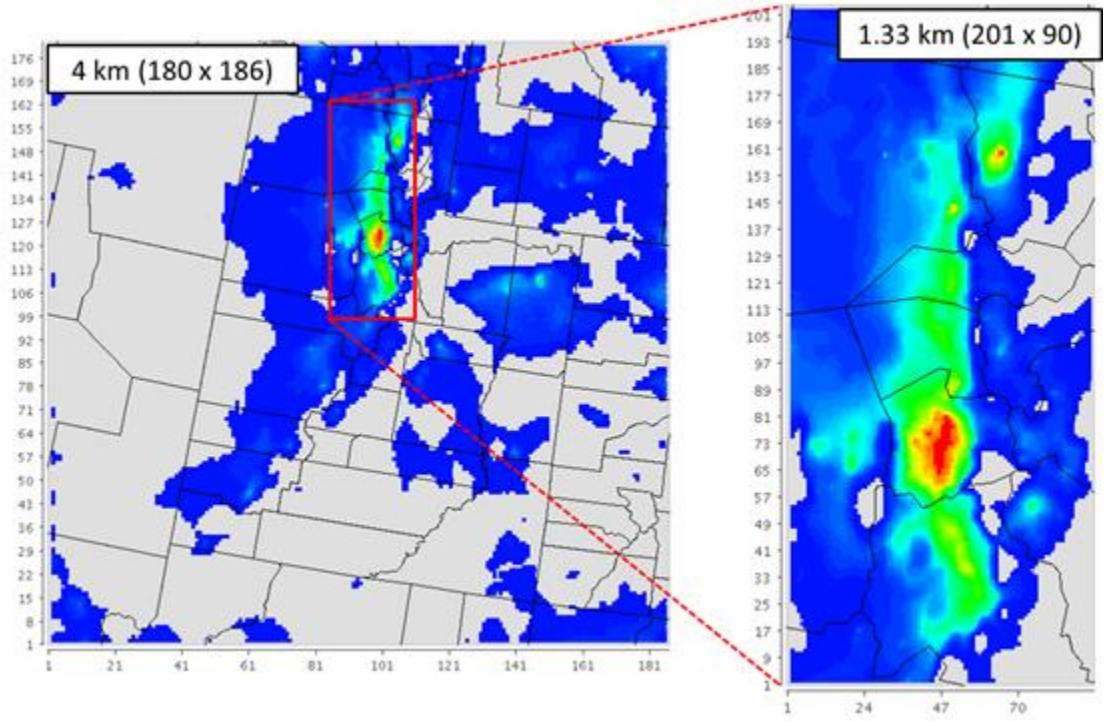

Figure 1. CAMx photochemical modeling domains in two-way nested configuration.

Table 1. Lambert Conformal Conic (LCC) projection parameters for both CAMx modeling domains.

LCC Parameter	4 km Domain	1.33 km Domain
Central Longitude	-97˚	-97˚
Central Latitude	40˚	40˚
Standard Parallel 1	33˚	33˚
Standard Parallel 2	45˚	45˚
Southwest Corner X-Origin	-1,644 km	-1,309.4 km
Southwest Corner Y-Origin	-312 km	78.579 km

Photochemical Model Specifications

Chemistry Mechanisms

The carbon Bond mechanism "CB6r2 with Halogen Chemistry" (CB6r2h) was used for gas-phase chemistry calculations and the coarse/fine (CF) scheme was used to represent aerosol speciation in all simulations. It is also noteworthy that UDAQ considered implementing the Volatility Basis Set (VBS) mechanism for modeling organic aerosols, but results from simulation tests did not show a significant difference in model performance that justified the emissions processing required for implementing the VBS mechanism.

Initial and Boundary Conditions

Initial and boundary conditions (IC/BCs) for the 4 km domain were extracted from MOZART[1] global model output along with the Mozart2CAMx v2.2 post-processor. BCs data for the 1.33 km CAMx modeling domain, which was run as a two-way interactive nest within the 4 km domain, were provided from the 4 km domain.

Given that PM2.5 concentrations were near background levels at the beginning of the January 2011 modeling episode, only one day of spin-up time was considered. The WRF model performs best when starting on a day with low PM2.5 levels (personal communication with Dr. Erik Crosman, Atmospheric Sciences, University of Utah).

A complete list of CAMx settings used for the model attainment demonstration is provided in Table 2.

[1] http://www.acom.ucar.edu/wrf-chem/mozart.shtml

Table 2. Key CAMx parameters/settings used for SIP modeled attainment demonstration.

Parameter	Parameter Setting
Number of Grids	2
Horizontal Grid Spacing	4 km/1.33 km
Vertical layers	41
Grid Interaction	Two-way nesting
Boundary Conditions	MOZART
Point Sources Processing	Plume-in-grid model
Aerosol Scheme	CF
Chemistry Mechanism	cb6r2h
Chemistry Solver	EBI
Advection Scheme	PPM
Dry Deposition	ZHANG03
Wet Deposition	On