Application of the WRF-Chem Model to MIRAGE-Mex

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The newly developed community regional chemistry/dynamic model WRF-Chem will be improved and used to support MIRAGE-Mex. Improvements of WRF-Chem will include:

(1) Implementation of a better surface model. We propose to enhance the model by integrating and urban canopy model (UCM) coupled to the Noah LSM (RAL). Urban development over large cities results in significant changes in landuse, vegetation cover and its characteristics (albedo, emissivity, vegetation density, etc). This work should improve the calculations of urban dynamics and chemistry/aerosols.

(2) Implementation of a better biogenic model. We will couple the biogenic model (MEGAN) developed by Alex Guenther with UCM/Noah and HRLDAS, and then couple this new capability with WRF-Chem.

(3) Improvement in the chemical solver and chemical initial conditions. The chemical solver will be improved to be more accurate and easily adaptable to new reaction mechanisms.

Scientific studies will include:

(1) Chemical forecast during field campaign (March 2006). The WRF-Chem model has already been run for February-March 2004 to get some insight on the outflow of the city plume. The model will be run in a forecast mode during March 2005 to get more useful information for the city plume and assist with flight planning.

(2) The chemical evolution inside the city.

(3) The impact of biogenic and biomass burning on the city plume.

(4) The impact of aerosols (including their impact on photolysis and the aerosol surface reaction on gas-phase chemistry) on the city plume.