MKWC forecasters rely on mesoscale model output for guidance in preparing custom forecasts for Mauna Kea. Early in 2008, the MKWC staff transitioned from MM5 to the Weather Research and Forecasting (WRF) model (Kemp et al 2007, http://www.wrf-model.org), the next-generation mesoscale numerical weather prediction system. WRF is a non-hydrostatic model with multiple nesting capabilities. The MKWC configuration includes 3 two-way nested domains, with horizontal grid spacing of 15, 3 and 1 km, corresponding to time steps of 75, 25 and 5 seconds respectively (Fig 1). The outermost domain covers a wide portion of the central Pacific area, the 3-km resolution domain spans all of the larger Hawaiian Islands, and the innermost domain is centered over the summit of Mauna Kea. Forty levels in the vertical are used. The vertical spacing is on the order of tens of meters for the levels nearest the ground and gradually increases with height as shown in the figure below. The model top is fixed at 10 mb, which correspond to an height of about ~25 km above the ground level. The WRF physics package used in the operational configuration includes (i) a 3-class simple ice scheme for the microphysics scheme (Hong et al 2004), (ii) the Kain-Frietsch cumulus convection scheme (Kain and Fritsch, 1990; Kain and Fritsch, 1993) for the 15- and 3-km domains, (iii) the Mellor-Yamada-Janjic (MYJ) planetary boundary layer scheme (Janjic, 2002), which solves the prognostic equation for the TKE, (iv) the RRTM longwave-shortwave radiation scheme (Mlawer et al, 1997).

The WRF model is run twice daily with 0000 and 1200 UTC initial conditions produced by the Local Analysis and Prediction System (LAPS, McGinley 1989, http://laps.noaa.gov/). LAPS is employed at MKWC to merge all the available data sources over the Central Pacific Ocean and produce coherent analyses of the atmosphere

for the WRF model domain 1 (see figure). Boundary conditions are updated every six hours using model output from the National Centers for Environmental Prediction Global Forecasting System (GFS). LAPS produces analysis fields of the wind, temperature, moisture and clouds by integrating observational data available in real time at the MKWC with the initial GFS analysis field.

The observational data used at the MKWC include synoptic surface data, local mesonet data, maritime and aircraft data, soundings, and atmospheric motion vectors. Most of these data are collected at MKWC by the Local Data Manager (LDM), which in turn is fed by the Meteorological Assimilation Data Ingest System (MADIS, NOAA http://madis.noaa.gov/index.html). High-resolution 10-bit satellite data are provided to the MKWC from the SATEPS/NESDIS program (NOAA). In addition, GPS data from a local network are provided by Dr. James Foster (SOEST, HI), and soon lightning data from Vaisala LLDN over the central North Pacific region will be added to the mix by Dr. Antti Pessi (SOEST, HI).

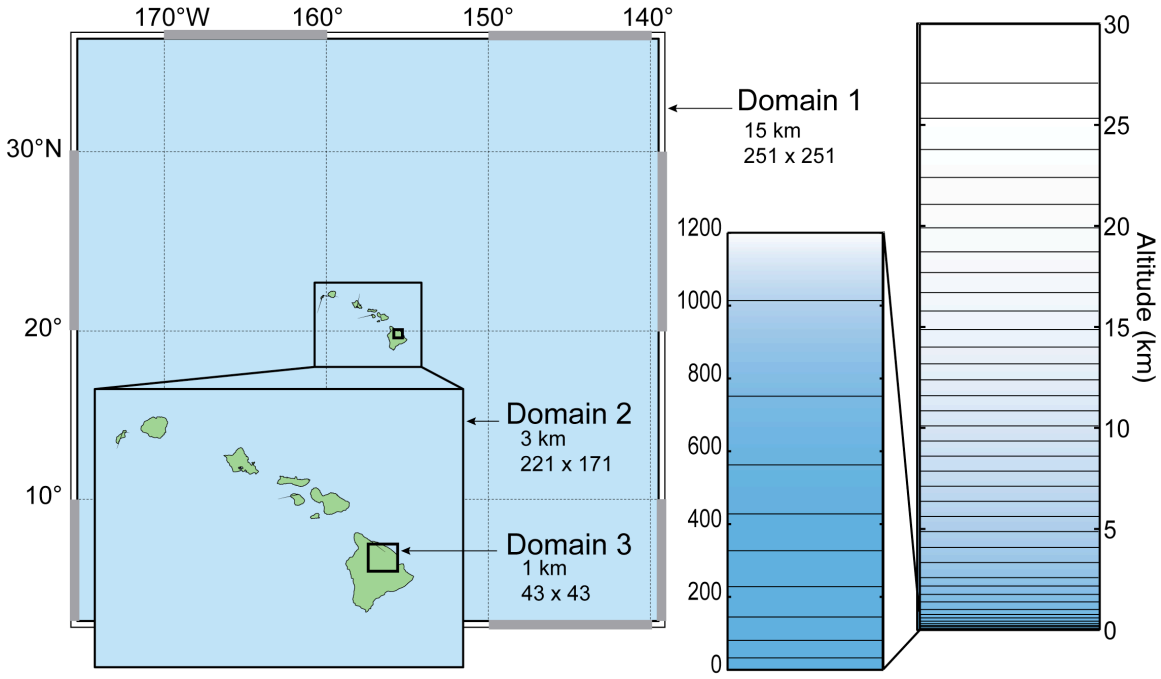

Fig. 1 MKWC configuration of the nested grids in WRF. Inset map shows an expanded view of the main island in the Hawaiian chain. The vertical resolution of the model is depicted in the diagram at right, including an expansion of the lowest 1200 meters of the model domain.