RevMexAA (Serie de Conferencias), **41**, 24–24 (2011)

ADVANCING THE UNDERSTANDING OF RADIATIVE PROPERTIES IN THE UPPER TROPOSPHERE: THE RHUBC CAMPAIGN ON CERRO TOCO

S. Paine[1] on behalf of the RHUBC-II team

An overview was presented of the RHUBC-II atmospheric science campaign, conducted in Chile in 2009.

Atmospheric radiation plays a fundamental role in the Earth's climate system. Validating atmospheric radiation models with accurate measurements is thus essential to ensure the accuracy of climate models. However, the far-infrared part of the spectrum, which plays a critical role in mid-troposphere radiative heating and accounts for approximately 40 percent of outgoing thermal radiation, has been relatively less studied than other bands. This is because the lower troposphere is opaque at these wavelengths, making ground-based radiometric measurements infeasible.

The Radiative Heating in Underexplored Bands Campaigns (RHUBC, Turner & Mlawer 2010), conducted as part of the Atmospheric Radiation Measurement (ARM) program of the US Department of Energy, have been undertaken to address this gap. The RHUBC campaigns have brought together ARM instrumentation, together with far-infrared spectrometers, at unusually dry sites from which foreground absorption in the troposphere is minimized. In addition to radiometric measurements, frequent radiosonde launches were carried out throughout the campaigns to measure the atmospheric state.

RHUBC-II was conducted from July through October of 2009 from a site at 5.3 km altitude on Cerro Toco, in the environs of the CONICYT science preserve hosting a number of international astronomical facilities, including ALMA. This presentation gave an overview of the campaign, which has produced a valuable data set from a diverse range of instruments.

A key issue in the analysis of campaign data is correcting for the known uncertainties associated with the humidity profiles measured by radiosondes. Under the dry conditions observed at the RHUBC-II site, it is not uncommon to find errors of up to twenty percent in the integrated water vapor column density derived from a sonde profile. In addition to overall scale errors, offsets and relative distortions of the profile can also occur. However, careful radiative closure analyses, using the diverse radiometric data collected during the campaign, can simultaneously calibrate the radiosonde profiles and constrain radiative transfer models.

Fig. 1. The RHUBC-II site on Cerro Toco. The view is towards the ALMA site, located on the plain in the background.

As an example, a simple scaling correction for sonde data was presented, using data from one of the instruments deployed in the campaign, the SAO submillimeter Fourier transform spectrometer. This was compared with a similar analysis based on contemporaneous data from a 183 GHz radiometer deployed for the campaign. These two simple scaling exercises showed good agreement; more sophisticated analyses are currently underway.

Further information about RHUBC-II can be found at `http://campaign.arm.gov/rhubcII/`. Campaign data will be made available through the ARM program archive at `http://www.archive.arm.gov/`.

REFERENCES

Turner, D. D., & Mlawer, E. J. 2010, Bull. Amer. Meteor. Soc., 91, 911

[1]Smithsonian Astrophysical Observatory, 60 Garden Street, MS 78, Cambridge, MA 02138 USA (spaine@cfa.harvard.edu).