

RHUBC Overview

Dave Turner, Eli Mlawer

Ed Westwater, Marty Mlynczak,
Maria Cadeddu, and Paul Green

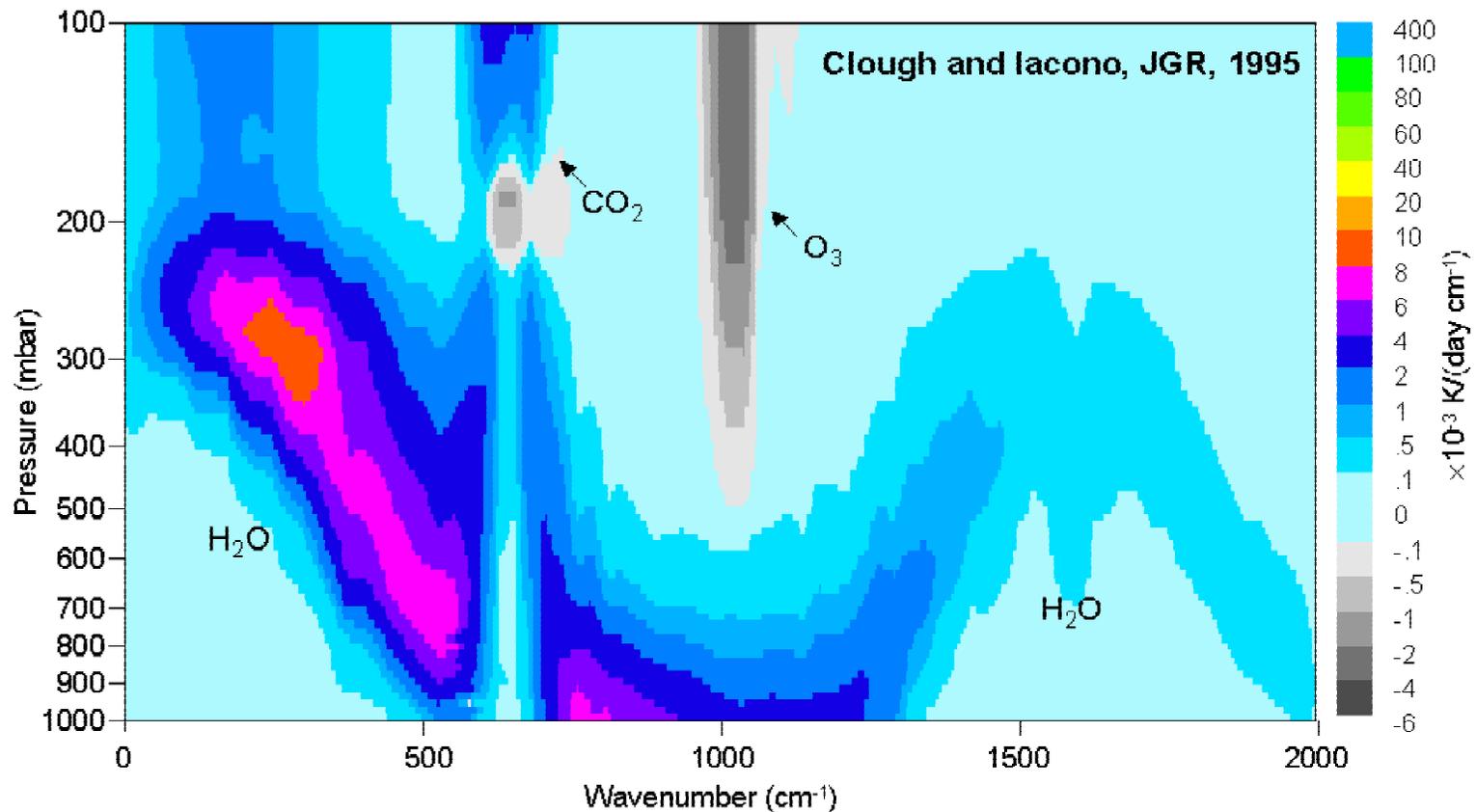
RHUBC-I

- Radiative Heating in Underexplored Bands Campaign
- 22 February - 14 March 2007
- NSA Site, Barrow, Alaska
- Principal Investigators: Dave Turner and Eli Mlawer
- Co-Investigators: Marty Mlynzcak, Paul Green, Ed Westwater, and Maria Cadeddu
- Key ARM instruments: AERI-ER, GVR, MPL, radiosondes, MWR, MWRP, pygeometer, MMCR
- Key IOP instruments: FIRST, TAFTS, and GSR
- *Status: funded, planning and pre-IOP activities are underway!*

Motivation

- Infrared cooling is dominated by the far-infrared (15 - 50 μm) contribution

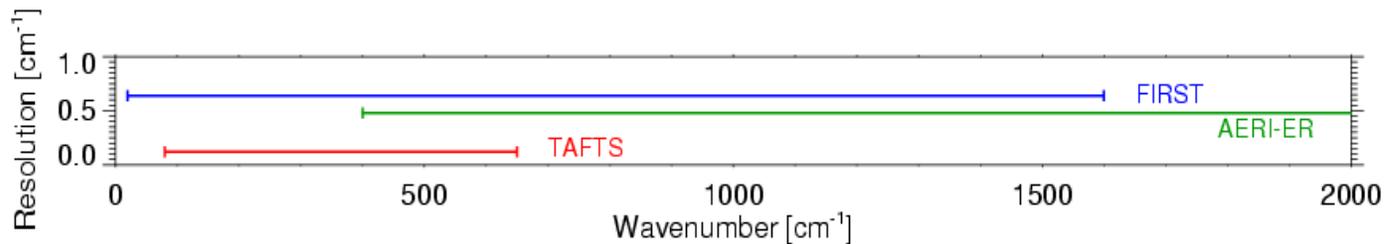
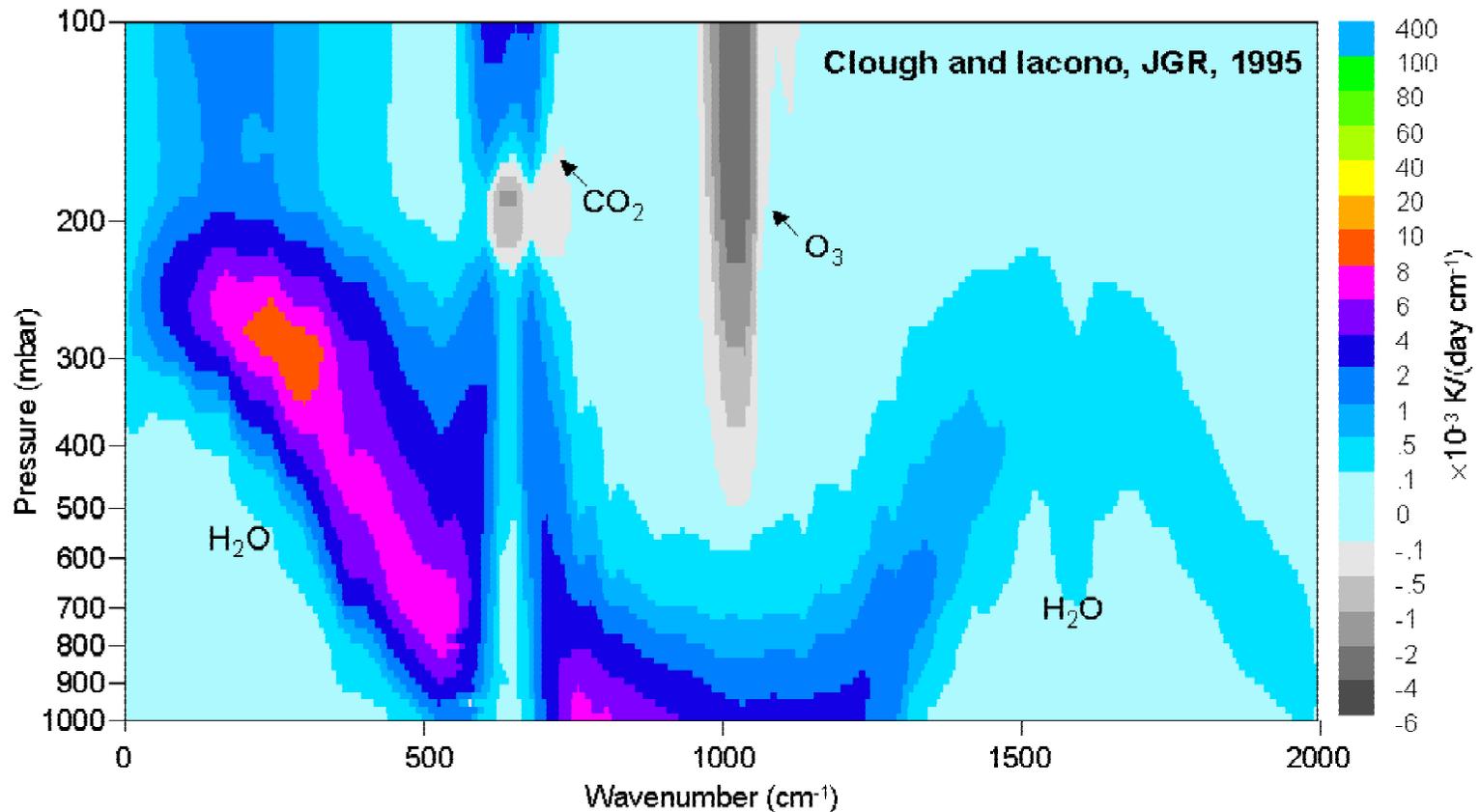
Longwave Spectral Cooling Rates



Motivation

- Infrared cooling is dominated by the far-infrared (15 - 50 μm) contribution
- Water vapor spectroscopy and continuum absorption in that band is highly uncertain due to:
 - Lack of good observations
 - Opacity of the atmosphere at most locations due to water vapor absorption

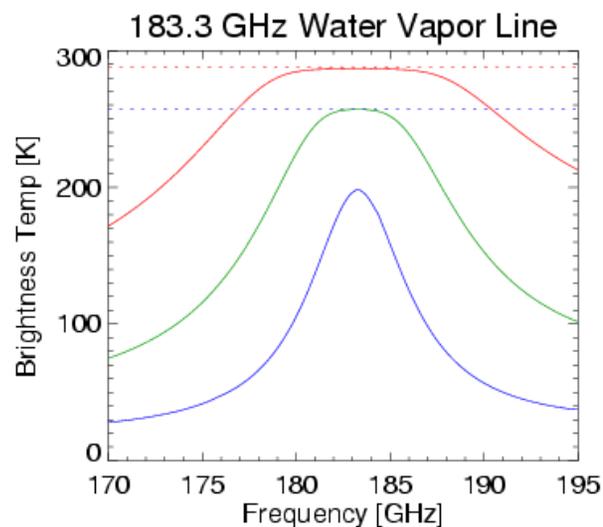
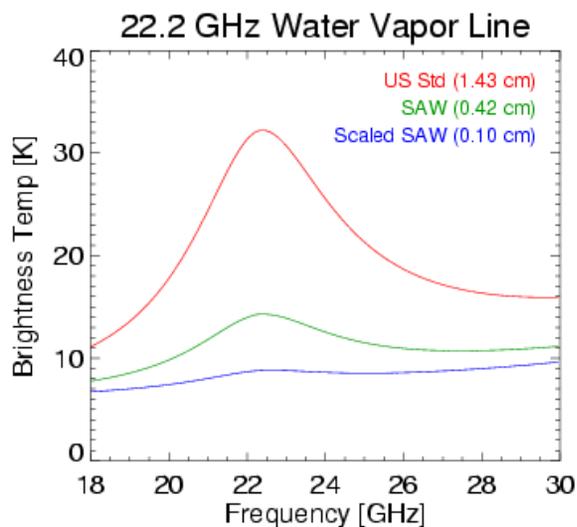
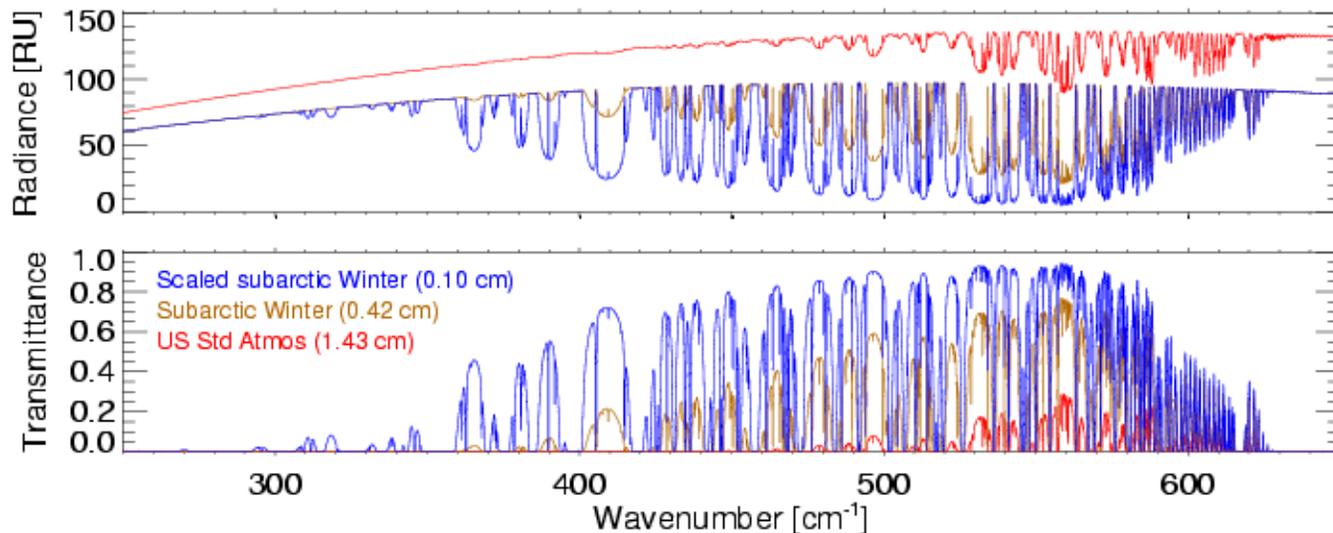
Longwave Spectral Cooling Rates



RHUBC Objectives

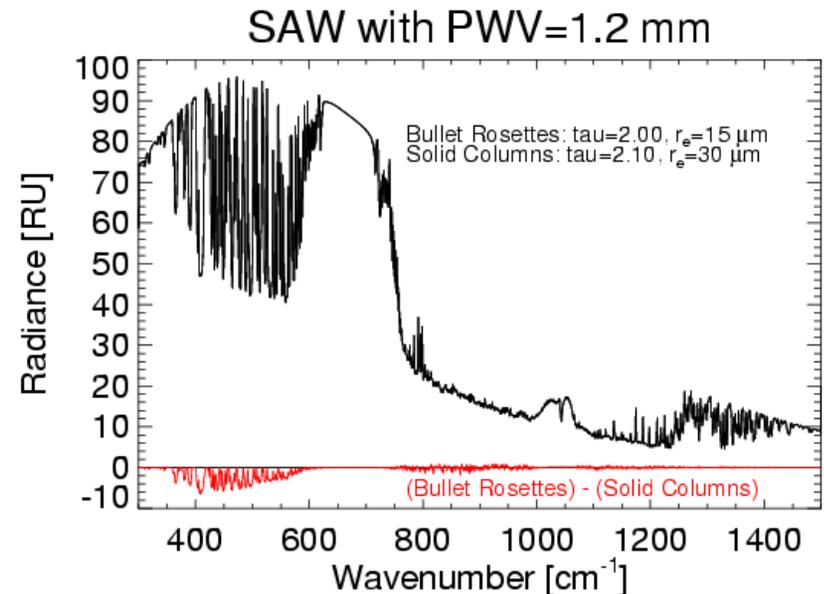
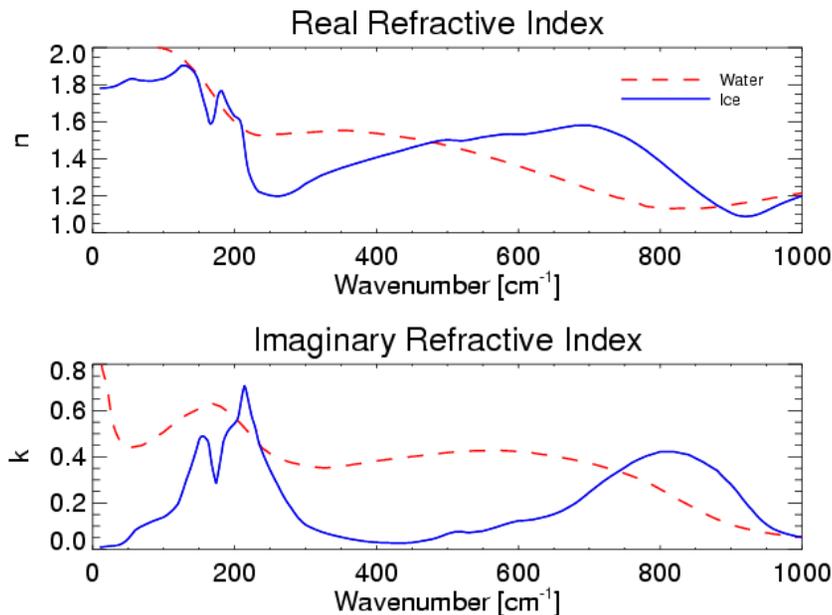
- To conduct clear-sky radiative closure studies in the far-IR (300 - 650 cm^{-1}) and ν_2 (1300-1800 cm^{-1}) water vapor bands
 - Reduce uncertainties in the water vapor spectroscopy
 - Both in the infrared and at 183 GHz
 - Validate/improve the foreign-broadened water vapor continuum
- FIRST / TAFTS / AERI-ER instrument cross-calibration
- GSR / GVR instrument comparison
- The investigation of the radiative properties of sub-arctic cirrus in the far-IR

Sensitivity of the Downwelling Radiance to Changing PWV



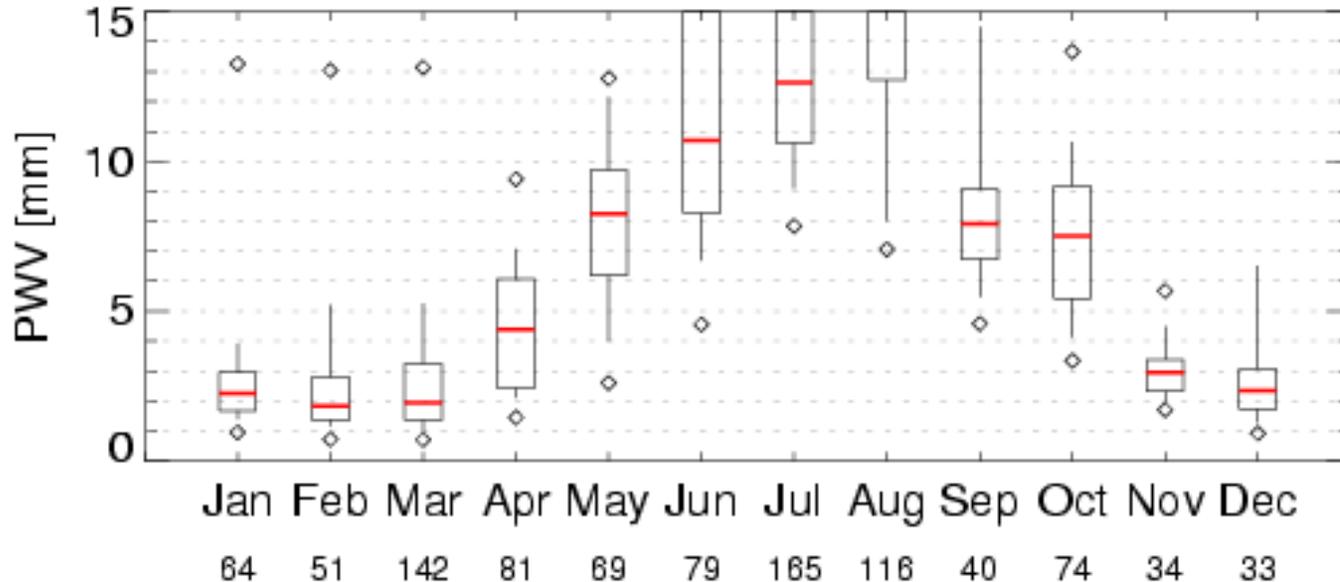
Cirrus Radiative Properties in Far-IR

- Minimum in the imaginary refractive index of ice near 400 cm^{-1} ; scattering thus becomes more important there. Strong ice absorption at 200 and 800 cm^{-1}
- Are the single scattering property models currently available consistent in both the $800\text{-}1200\text{ cm}^{-1}$ and $200\text{-}600\text{ cm}^{-1}$ bands?



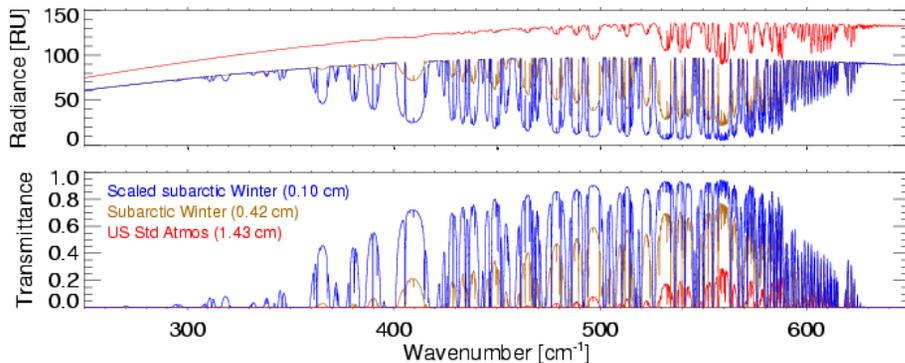
Choice of Experiment Dates

- Arctic is characterized by frequent low-level overcast periods
- Late winter period (Feb-Mar) have the most frequent clear sky periods, climatologically
- Lowest PWV conditions occur in Feb-Mar
- Some cirrus events will occur in Feb-Mar

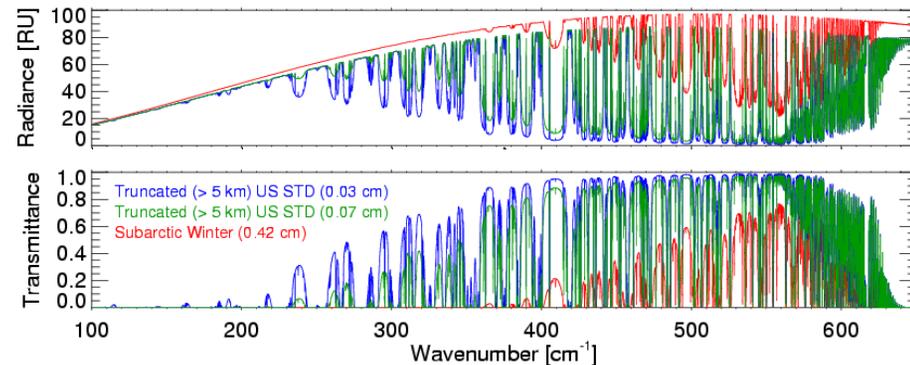


Summary

- RHUBC-I is funded, and pre-IOP activities are getting underway. The experiment will be here soon (starting mid-February), so we are hustling...
- We are planning for:
 - Wildly successful RHUBC-I; clear sky conditions with low PWV, some cirrus episodes, all equipment works, etc, etc!
 - RHUBC-II as a follow-up experiment in the high Chilean plains (5+ km MSL); PWV should be nearly an order of magnitude lower.



Barrow during RHUBC-I



Chajnantor during RHUBC-II