USE OF THE JUNO MICROWAVE RADIOMETER (MWR) IN THE STUDY OF JOVIAN ATMOSPHERIC COMPOSITION, STRUCTURE, AND DYNAMICS

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The Juno Microwave Radiometer (MWR) has six channels ranging from 1.36–50 cm and the ability to peer deep into the Jovian atmosphere. Various retrieval methods have been implemented to advance the understanding of Jupiter's atmospheric composition, structure, and dynamics through microwave radiometry. This work includes laboratory measurements which have been used to refine previously-existing models for the microwave opacity of gaseous ammonia and water vapor. Additionally, this work involves integration of these new models, plus an additional model (derived as part of this work) for the microwave opacity of potential precipitation, into an existing forward model for emission from the jovian atmosphere.

Utilizing these models an Artificial Neural Network algorithm has been developed to rapidly perform inversion for the deep abundance of ammonia, the deep abundance of water vapor, and atmospheric "stretch" (a parameter that reflects the deviation from a wet adiabate in the higher atmosphere). This algorithm is "trained" by using simulated emissions at the six wavelengths computed using the Juno atmospheric microwave radiative transfer (Janssen et. al. 2013, Icarus, 226, 522–535). By exploiting the emission measurements conducted at six wavelengths and at various incident angles, the neural network can provide preliminary results to a useful precision in a computational method hundreds of times faster than conventional methods. This can quickly provide important insights into the variability and structure of the Jovian atmosphere.

With the potential to probe as deep as 1000 bars, the Juno MWR can probe well beneath the water clouds. In order to allow for necessary cloud depletion, precipitation will likely occur at some times and locations over the Jovian disk. Initial review of Juno MWR data will be presented along with demonstrations of retrieval methods.