THE MARCI WATER ICE CLOUD (OPTICAL DEPTH) PRODUCTS FOR ASSIMILATION

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Introduction: The goal of this presentation is to provide a brief overview the algorithms involve, 2) describe the types of products that have been produced for various modeling groups; 3) summarize some comparisons of the observations with the predictions from several GCMs**; but most importantly, 4) solicit input and discussion on additional formats that might be desirable, particularly for data assimilation**.

Random MARCI Dataset Details:
The MARCI instrument and its performance/calibration have been described elsewhere, including the UV channels [3,4,5]. The specific details relevant to the water ice retrievals are involve "Band 7", which has a centroid of 321 nm, a radiometric accuracy of ~6-8%, and a radiometric precision of 2-3%. The intrinsic spatial sampling of Band 7 provides near-global daily coverage at ~8 km/pixel (nadir). The "near" qualification for coverage stems from the fact MRO's orbit is too low to spatially contiguous optical depth values (outside of the polar regions).

Basic Retrieval Products: For every mapping day (for which observations are obtained), a water ice cloud optical depth image and associated metadata "backplanes" are produced, corresponding pixel-by-pixel to each MARCI image "strip." (12-13 per day). An example of the coverage can be seen Figure 1, which is the map-projected "mosaic" all the "tau" strips from day 222 of 2010 (L_S=131°, MY 30). This mosaic also highlights the weakness of the current retrieval in that surface ice is retrieved as cloud opacity. Such pixels are flagged (but not eliminated) in the polar region during a post-processing step (using a seasonally dependent cap-radius and the I/F values). This approach allows the tabulation of optical depth values without the need to depend on detailed validity of cap location algorithm. The potential for confusion due to surface ice outside of the polar regions remains present (e.g., in craters or the floor of Hellas).

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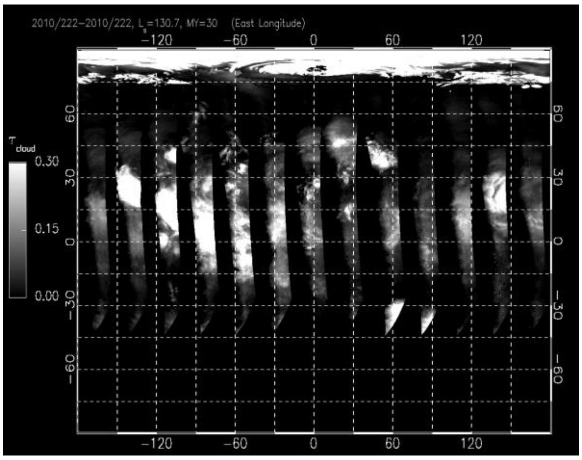

Figure 1. Daily Global Map (mosaic) of the water ice cloud optical depths for a representative aphelion season "day" (LS=131°, MY 30). Eastern Longitude convention used. The opacity associated with polar cap highlights the limitation of the current retrieval algorithm over icy surfaces. We attempt to flag such pixels in a post-processing step while leaving the retrieved values intact to avoid the need to reprocess for different polar cap "models."

A basic database of MARCI retrievals is constructed by including every valid retrieval pixel (including potential polar cap pixels) and the associated metadata for that pixel (e.g., ephemeris time, atmospheric state variables like surface pressure, dust column; photometric angles; local time). The database key is composite and involves (time, longitude, latitude). Each included "tau" pixel is a unique record. However, the resulting dataset (at the native resolution) is > 60 GB for all retrievals through the end of MY 31, even when stored as compressed (scaled) integers. To make a more tractable product, one can choose a lower resolution spatial mesh. Binning the retrievals for each mapping day on a 1°x1° spatial grid results in database size of ~1 GB (compressed). In addition, higher-level datasets/products can be constructed easily by searching the database and potentially “binning” the query results. In the next sections, we provide several examples of such higher-level products and briefly describe the public data products (including their location).

References: [1] Malin et al., 2008,Icarus, 194, 501. [2] Bell et al. 2009, Journal of Geophysical Research (Planets), 114, E08S92; [3] Wolff et al. 2010, Icarus, 208, 143

XXXIII, Abstract #1402. Please use captions with figures and tables.