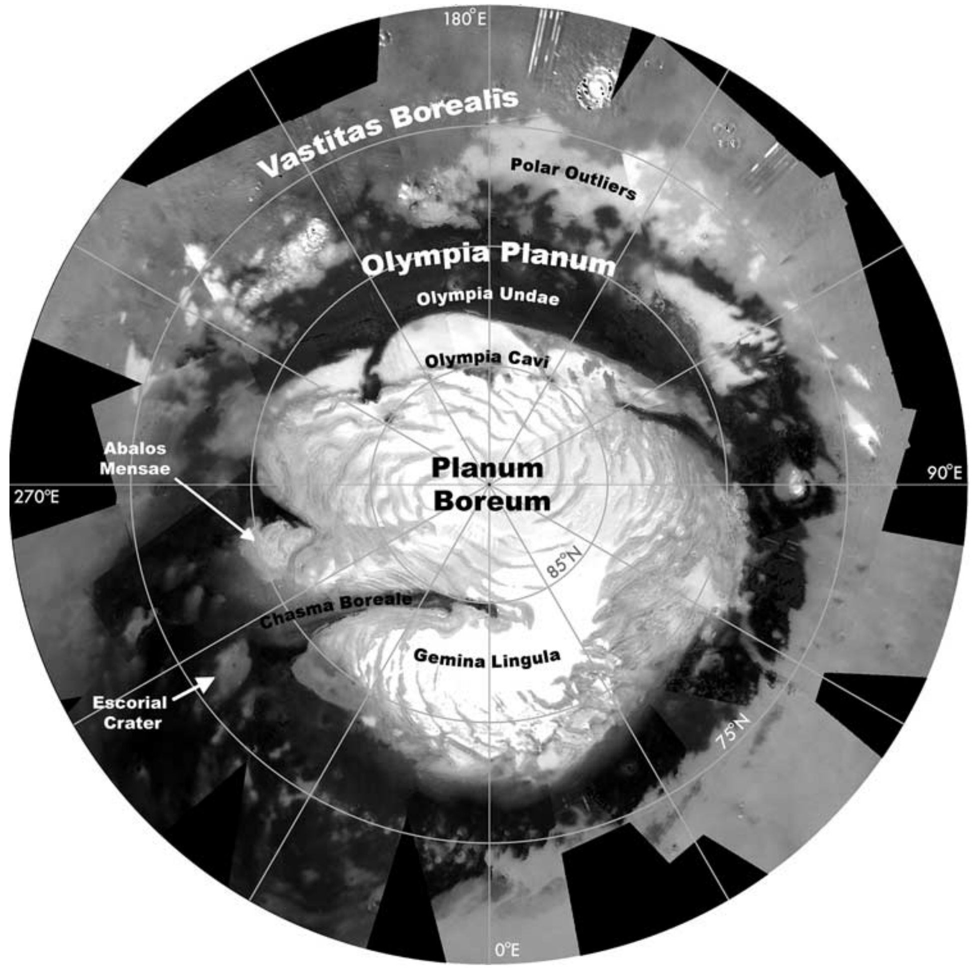

Figure 1. OMEGA 0.9-1.1 μm average estimated Lambert albedo mosaic of the 45 early northern summer image cubes used in our study (Table 1), stretched between 0.1 and 0.6. Geographic names mentioned in text are indicated.

[2005a] further suggested that the water necessary to form gypsum was most likely present in or near Olympia Planum owing to outflows from the ice cap during a warm climate excursion, but did not propose a source for sulfur-rich material. *Fishbaugh et al.* [2007] reported that although the gypsum deposit is nearly exclusively associated with the dark dunes, there were no apparent correlations between the presence of gypsum and the physical or thermal characteristics of the dune field in the THEMIS data included in their study. Those authors proposed that the water necessary for gypsum formation emanated from the ice cap during a purported Chasma Boreale melting event [*Fishbaugh and Head*, 2002] or during an impact melting event in the region near the highest gypsum concentrations. Alternatively, *Tanaka* [2006] and *Tanaka et al.* [2008] argued that there is no clear geologic evidence for polar outflows during the Amazonian. Instead, they proposed that the Scandia geologic unit may consist of volcanic or hydrothermal deposits, and that the gypsum may be sourced directly from this older (early Amazonian) unit. Indeed, deposition of large quantities of sulfates since the emplacement of the young (late Amazonian), transient dune fields does not easily fit within the OMEGA global hypothesis of sulfate deposition during the Hesperian [*Bibring et al.*, 2006].

[4] In this study, we examine hydration in the entire north polar region to establish a regional context for the Olympia Planum sulfates, to test the proposed OMEGA global mineralogic history in the region, and to propose additional or alternate hypotheses to explain the observed mineral distributions and their geologic/stratigraphic context. If the sulfates are limited to Olympia Planum, then they may be intimately related to the dunes and much younger than sulfate deposits elsewhere on Mars; alternately, hydrated minerals associated with older deposits elsewhere in the region may suggest less recent water activity in the region and a possible source for the gypsum from older deposits.

[5] This mapping effort differs from previous OMEGA and Mars Reconnaissance Orbiter/Compact Reconnaissance Imaging Spectrometer (MRO/CRISM) mapping efforts [*Langevin et al.*, 2005a; *Roach et al.*, 2007; *Pelkey et al.*, 2007] because we have developed a technique (described in section 4.2) that allows us to search for hydrated minerals in water ice-rich areas, which previously have not been examined. By using this new technique, we have been able to verify the OMEGA sulfate detection as well as to expand on the OMEGA results with a more detailed search for other hydrated deposits in the region. In addition, our ongoing laboratory studies of potential mineralogies for the hydrated