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Saturn's zonal structure at depth: Dimensional characteristics and constraints on temporal variability over 3 years of Cassini/VIMS mapping

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Saturn's deep zonal cloud structure near the 3-bar level has been observed for nearly three years by the Visual Infrared Mapping Spectrometer onboard the Cassini/Huygens orbiter. The dimensional characteristics (e.g., spatial dimensions and spacing) of deep clouds provide information on vertical dynamics at depth. Over much of the planet, the cloudy zones at depth (comprised, putatively, of ammonia hydrosulfide clouds, but perhaps with an admixture of water clouds) are arranged in surprisingly narrow axisymmetric bands, typically less than 2 degrees of latitude in width, twice as narrow as typically observed at higher altitudes near the 1-bar levcl. This difference suggests that either (1) the patterns of ascending/descending motion have smaller latitudinal lengthscales at several bars than at shallower levels, and/or (2) latitudinal (horizontal) mixing is better able to "smooth out" the cloud structure at shallow levels ($\sim$1 bar) than it can at several bars. In the northern temperate region, a unique array of several dozen clear spots alternates with cloudy regions, forming a "string of pearls" of wavenumber $\sim$100 covering 1/4 of the latitudinal circle at 40 degrees N. latitude, reminiscent of a von Karman vortex street. We will present results of our analysis of the positions and widths of zonal structures and the wave characteristics of the "string of pearls" as measured periodically during the Cassini mission to place

constraints on the temporal stability of such global-scale features at depth in Saturn.