



Clouds and Precipitation on Titan Modeled with the Titan Regional Atmospheric Modeling System (TRAMS)

E. L. Barth and S. C. Rafkin

Southwest Research Institute

The types of clouds which are able to form in Titan's atmosphere depend on the amount of methane present. For an environment such as the Huygens landing site, there is insufficient convective available potential energy (CAPE) for convection to occur and only thin stratiform clouds form. The appearance of convective clouds at the South Pole then points to a more humid environment. We use the Titan Regional Atmospheric Modeling System (TRAMS) to study the types of clouds formed in differing methane environments. TRAMS is a three-dimensional, time-dependent, coupled dynamic and microphysics model for simulating clouds in Titan's atmosphere. These clouds are composed predominantly of methane (ice or liquid with dissolved nitrogen), but also include the effects of ethane, which could play a significant role in the stability of raindrops near the surface. Methane condensation can grow particles up to radii of 1 mm. In convective clouds, coalescence is an important process, growing cloud particles to several millimeters radius. These clouds produce upwards of 10 of centimeters of surface precipitation, depending on the efficiency of the coalescence process.