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Science missions to Saturnian satellites: how low can you go?

T. Spilker (1), R. Lorenz (2), J. Spencer (3), K.Reh (1), J.Elliott (1), and the Titan-Enceladus Studies Team

(1) Jet Propulsion Laboratory/California Institute of Technology, California, USA, (2) Applied Physics Laboratory/Johns Hopkins University, Maryland, USA, (3) Southwest Research Institute, Colorado, USA (Thomas.R.Spilker@jpl.nasa.gov / Fax: 818-393-9815 / Phone: 818-354-1868)

Cassini/Huygens (C/H) mission investigations have verified multiple Saturnian satellites as objects of interest to a wide range of planetary scientists, including astrobiologists. Phoebe, Iapetus, and of course Titan and Enceladus have all attracted significant attention, and Dione and Rhea as well await further detailed exploration during the C/H prime and extended missions. Titan and Enceladus are generally considered the top two priorities in that list, in part due to their astrobiological import. Planetary scientists and NASA have been examining possibilities for future missions to these destinations to follow the highly successful C/H mission and provide more detailed investigations of these objects.

Recently NASA began a study of potential *relatively* low-cost missions to Titan or Enceladus, led by the Jet Propulsion Laboratory (JPL) and involving scientists and engineers from JPL, Applied Physics Laboratory (APL), Southwest Research Institute (SwRI), Science Applications International Corp., California Institute of Technology, Washington University of St. Louis, and NASA's Goddard Space Flight Center, Ames Research Center, and Kennedy Space Center. Recognizing that travel to the Saturn system is significantly more difficult than travel even to Jupiter, the giant planet nearest to Saturn, and having funded the Juno mission to Jupiter in its New Frontiers Program of sub-flagship-cost missions, NASA is interested in determining whether there are scientifically viable missions to Titan or Enceladus within the programmatic constraints of a (possibly slightly expanded) New Frontiers mission. NASA assembled an engineering team based at JPL and appointed five-member science teams to both the Titan

and Enceladus studies, headed by Ralph Lorenz of APL and John Spencer of SwRI, respectively. Since October these teams have been assessing science objectives for the two destinations and surveying architectural options for implementing worthwhile subsets of the global lists of science objectives, in an attempt to find mission concepts that are both scientifically justifiable and fit within New Frontiers constraints. The extremely capable nature of the C/H mission instrumentation and the thoroughness of C/H investigation of the Saturn system make that a difficult, though not obviously impossible, task. Any such mission must go well beyond the C/H capability to be scientifically worthwhile.

These studies are scheduled to be complete and results reported to NASA before the end of February 2007. This presentation gives the results of the studies and examines possible follow-on work.

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