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DRAGONFLY: in situ exploration of Titan's meteorology

Scot Rafkin (1), Ralph Lorenz (2), Elizabeth Turtle (2), Jason Barnes (3), Melissa Trainer (4), Alice Le Gall (5), Juan Lora (6), Chris McKay (7), Claire Newman (8), Mark Panning (9), Kristin Sotzen (2), Tetsuya Tokano (10), Colin Wilson (11), and the Dragonfly Team

(1) Southwest Research Institute, Boulder, CO, USA, (2) Johns Hopkins Applied Physics Lab., Laurel, MD, USA, (3) Univ. Idaho, Moscow, ID, USA, (4) NASA Goddard Space Flight Center, Greenbelt, MD, USA, (5) Laboratoire Atmosphères, Milieux, Observations Spatiales, Guyancourt, France, (6) Univ. California, Los Angeles, CA, USA, (7) NASA Ames Research Center, Moffett Field, CA, USA, (8) Aeolis Research, Pasadena, CA, USA, (9) Jet Propulsion Laboratory California Institute of Technology, Pasadena, CA, USA, (10) Inst. fur Geophysik und Meteorologie, Univ. Koln, Koln, Germany, (11) Oxford Univ., Oxford, UK

Dragonfly is a rotorcraft lander mission currently in a Phase A study under NASA's New Frontiers Program that would take advantage of Titan's dense atmosphere and low gravity to visit a number of surface locations to study how far chemistry can progress in environments that provide key ingredients for life. This mission architecture also permits and demands investigation of Titan's atmosphere.

First, *Dragonfly* is a lander that will spend >2 Earth years on Titan's surface, long enough to observe many diurnal cycles, atmospheric waves, and perhaps even some seasonal change. The DraGMet (*Dragonfly* Geophysics and Meteorology) instrument package includes measurement of wind speed and direction (using sensors on each of the four rotor pylons, to assure that one or more sensors are upwind of and thus unperturbed by the vehicle), temperature and pressure, and methane humidity. A camera suite will also include panoramic imaging, informing atmospheric optics and possibly cloud motions.

Second, through its flight capability, *Dragonfly* can explore the micrometeorology at a number of different locations with different terrain settings, as well as making repeated vertical profiles of temperature, methane, and hydrogen to constrain mixing in the atmospheric boundary layer at different times of day.

Dragonfly will also contribute to atmospheric science in a number of other ways: electric field measurements; seismic observations, which may include an atmospheric component; measurements of surface properties, which include soil moisture; chemical composition of surface deposits, which may contain the products of high-altitude photochemistry; identification of fluvial sediments may inform our understanding of the hydrologic cycle; and measurement of the saltation threshold (using the vehicle's rotors) will improve interpretation of dune morphology and circulation patterns. *Dragonfly* results will test and improve atmospheric models, feeding forward into a deeper understanding of the local and global Titan climate system.