GUSTO: Gal/Xgal U/LDB Spectroscopic-Stratospheric TeraHertz Observatory

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Abstract

GUSTO is a recently selected NASA Explorer mission that will map in unprecedented detail the structure, dynamics, energy balance, and evolution of the interstellar medium within the Milky Way and Large Magellanic Cloud. GUSTO is a balloonborne, 0.85-m on-axis telescope that will observe in three important interstellar lines: [CII], [OI], and [NII] at 158, 63, and 205 microns, respectively. With its 60" angular resolution, high-velocity resolution, and efficient "On-The-Fly" mapping strategy, GUSTO will address key unanswered questions about the stellar life cycle and provide new insights into the birth and evolution of stars and galaxies. From its Ultra-Long-Duration Balloon (ULDB) platform at an altitude of 33 km, GUSTO will survey ~100 deg2 of the Milky Way and 24 deg2 of the LMC at 60" angular resolution using three 8-pixel heterodyne array receivers. The GUSTO receivers provide sub-km/s velocity resolution and bandwidths sufficiently wide to track all clouds orbiting in the Milky Way and LMC. GUSTO will detect and locate in three dimensions every important interstellar cloud (AV > 0.5-1) in the surveyed regions. The baseline mission of 100 days can be completed in one ULDB Antarctic balloon flight, and an extended mission of up to days is possible. GUSTO's observing 169 campaign comprises three distinct surveys: GPS: A Galactic Plane Survey (42 days); LMCS: An LMC Survey (36 days); TDS: Targeted Deep Surveys of selected regions in the Galaxy and LMC (18 days). In our presentation we will discuss both the science goals of GUSTO and the mission implementation.



Figure Insert: The GUSTO gondola design with major components labeled (left). A schematic diagram of the life cycle of the interstellar medium, the main science motivation for the GUSTO mission (right)