MIMOSA a space borne nadir looking P-band system for mapping and monitoring the Antarctic ice sheet

Monique Dechambre, Alain Herique,Frederic Parrenin,Frederique Remy,Pascal Lacroix
CETP/IPSL

monique.dechambre@cetp.ipsl.fr

The main issue in climate-glaciological considerations is the mass balance of the large ice sheets. Applications of existing models require a number of observations in order to understand past evolution and to predict future evolution. Up to now, satellite microwave radars and optical sensors provide global information about surface and subsurface state, only. For instance, radar altimeters provide global surface topography maps, scatterometer provides katabatic wind direction, SAR or optical sensors provide information on surface roughness, interferometry provides surface velocity field. These data deeply modify our knowledge of ice sheet. Nevertheless, volume information is still lacking. They are so far only performed by means of airborne low-frequency sounders. Due to the very large extent and the limited range of aircraft large parts of the Antarctic ice sheet has not been sounded, except along few tracksHowever, ice thickness, bedrock topography, internal layering and basal conditions would provide an essential information for numerical modeling and also for glaciological studies. The purpose of MIMOSA is to develop a spaceborne nadir looking P-band Synthetic Aperture Radar to observe the Earth surface at depths beyond the superficial layers, with horizontal resolutions from 1km to few tens of km and monthly temporal coverage, in order to improve our understanding of the Earth processes involving global scale monitoring of continental ice (major issue), vegetation and soil surfaces (secondary exploratory objectives). MIMOSA will be complementary to existing and forthcoming space borne optical and radar observation systems, which are limited to observations of superficial surfaces. This exploratory mission should have a duration of two years. The frequency will be 435 MHz, with a 6 MHz bandwidth. It will be implemented on a satellite launched in a true polar orbit at an altitude of ~ 500 km. The temporal repeat cycle is designed to provide a total coverage of the Antarctica during the two years. The instrument is a ground penetrating radar primarily designed to sound the Antarctic ice sheet.The scientific objectives as well as the instrument design are presented.