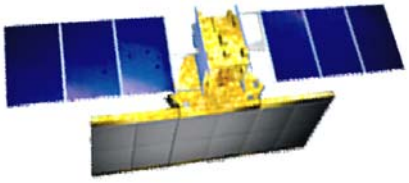
# In this issue

## Radar Imaging Satellite-1

With the launch of Radar Imaging Satellite-1 (RISAT-1), a new chapter has been opened in Indian Space Research Organisation's (ISRO), Earth Observation (EO) programme – indigenous capability of developing, launching and operation of microwave imaging sensor. A set of five articles, in this special issue, traces all aspects of RISAT-1 from developing the SAR sensor to illustrating different possibilities of utilizing its data in day to day practical applications. In the Foreword, A. S. Kirankumar (**page 444**), one of the prime architects of ISRO's EO programme, enunciates the significance of RISAT-1 from the overall perspective of ISRO's EO mission, especially how it complements existing array of sensors in optical bands and its additional strengths which are unique to microwave bands and its ability to measure all the components of electromagnetic waves, i.e. polarization, amplitude and phase.

RISAT-1 Synthetic Aperture Radar (SAR) payload is a complex payload with a very large array of imaging capabilities in-built. It is not only ISRO's first SAR payload in space, but also India's first state-of-the-art active antenna in space. Further, for the first time, it is carrying the capability of all traditional SAR imaging modes in optional hybrid polarimetry configuration. Design philosophy behind RISAT-1 SAR, its realization, illustration of initial results and its calibration have been brought out in the article by Tapan Misra *et al.* (**page 446**).

RISAT-1 SAR is the heaviest payload built in ISRO, weighing close to 950 kg. The challenge was to accommodate it in a satellite bus which can be flown in PSLV. The large SAR antenna provides obstruction to viewing geometry of satellite sensors and data transmission systems. Further, designers wanted a simplified antenna deployment system which guarantees success. Moreover, spacecraft resources have to cater to large power demand (~5 kW) and high data rate (~1.5 Gbps) for SAR operation. All these requirements resulted into a



new and unique bus configuration, distinct from ISRO's traditional workhorses like IRS and INSAT. The complete gamut of RISAT-1 satellite configuration is presented by N. Valarmathi *et al*. (**page 462**).

RISAT-1 is also the heaviest satellite (dry mass wise) built in ISRO, bordering on the outer limit of the launch capability of highest version of PSLV. Specific PSLV XL launcher configuration and its resultant performances, very close to the intended ones, are presented in the article by P. Kunhikrishnan *et al.* (**page 472**).

RISAT-1 has a very large number of flexible imaging capabilites, operated transparently by on-board computer. For its seamless operation, complex mission planning and operation were built in ground control of spacecraft from ISTRAC, Bangalore. Further, ISRO's data reception system at NRSC, Hyderabad had to be upgraded by six folds from 110 to 640 Mbps for RISAT-1 operation. The data processing, archiving and dissemination system for RISAT-1 had to be integrated in new IMGEOS facility of NRSC. The heart of the ground segment is a complex SAR signal processor, implemented in both off line and near real time processing systems at NRSC, to convert noise like SAR signals to meaningful digital images with all the corrections and map projections for dissemination to users in user friendly and universally acceptable data formats. All the facets of Ground Segment, as these activities are referred to in ISRO parlance, are presented in the article by V. Mahadevan *et al.* (**page 477**).

Ultimate aim of RISAT-1 programme is to convert digital images to meaningful, user-specific geophysical, ecological and myriad other application information so that strength of RISAT-1 data is harnessed by governmental agencies, commercial entities, global users, resource scientists and general public. During the course of spacecraft's lifetime and beyond, there is a possibility of getting the data used for many different applications, limited by basic physics behind the radar signal, its interaction with earth elements and ingenuity of resource scientists. Very initial results, in this endeavour, are presented in the article by Manab Chakraborty *et al.* (**page 490**).