Announcement of a Special Issue of *Advances in Space Research* on

Parameter Retrieval and Applications with Imaging Spectroscopy Data from AVIRIS-NG

Papers are invited for a special topical issue of *Advances in Space Research* (ASR) entitled **"Parameter Retrieval and Applications with Imaging Spectroscopy Data from AVIRIS-NG".**

Non-invasive estimation of various bio-geophysical and geochemical constituents of material and their abundance at space-time scales is essential to characterize and quantify earth/planetary system processes. Hyperspectral remote sensing from airborne and space-borne platforms offers better precision to detect and quantify the intended parameters through unique diagnostic band absorption depths in narrow bands (< 5 – 10 nm) of few hundreds in continuum than a few broad discrete bands from multispectral remote sensing. Imaging spectroscopy is the fundamental basis of hyperspectral remote sensing where the spectra at each pixel is obtained in electromagnetic (EM) spectrum through the advanced spectroscopic measurements from instruments that use convex or prism grating technology. Reflectance spectroscopy is generally used for EM region < 3000 nm while emission spectroscopy is used for EM region > 5000 nm. The high precision of retrieval of parameters from the observed spectra and quality of applications require high Signal-to-Noise Ratio (SNR) for such spectroscopic instruments.

In the past, several space-borne imaging spectrometers have provided reflectance spectroscopy data from NASA's EO Hyperion and ISRO's HySI missions from AIMS-1, 2, 3, AHySI spectrometers. The major limitations of these previous spectrometers were (i) low SNR, (ii) sometimes restricted to VNIR (400 – 900 nm) band region and (iii) less availability of data. Different space agencies have planned to launch missions with imaging spectrometers with advanced technology to overcome the above limitations and provide systematic coverage of imaging spectroscopy data mostly in 300 to 2500 nm band region for both scientific and commercial civilian uses. Among them, Italian Space Agency has launched PRISMA space-borne mission while DLR, Germany has put DESIS hyperspectral instrument on International Space Station (ISS) as precursor of EnMAP satellite mission. There are other Spaceborne missions which are in the pipeline such as SHALOM, HyPSIM, HISUI, SBG/HysPiRI, GISAT HySI to name a few.

The imaging spectroscopy data are three-dimensional (3D) which are obtained as data cube. This becomes 4D with the systematic observations at regular time-step. Thus, the data become part of so called 'big-data'. The development of scientific expertise and analytical ability of such 'big data' requires adept handling and usage of airborne imaging spectroscopy data as a precursor. ISRO and NASA have therefore jointly carried out extensive airborne hyperperspectral campaign with the AVIRIS-NG instrument. This provides imaging spectroscopy data over more than 100 sites in India in the spectral range of 380 – 2510 nm at 5 nm intervals with high SNR (>2000 @ 600 nm and >1000 @ 2200 nm) having an accuracy of 95%. Ground Sampling Distance (GSD) varies from 4 – 8m for flight altitudes of 4 – 8 km with swaths range of 3-6 km. These imaging spectroscopy data can be used as reference spectral library for any further retrieval, analysis, interpretation, applications, process modelling not only with airborne data but also for space-borne imaging spectrometer data. Different academia, scientific

organizations both in India and USA have worked with these imaging spectroscopy data from AVIRIS-NG with unprecedented radiometry.

This special issue invites those papers, which make a significant and innovative contribution in AVIRIS-NG data processing, retrieval techniques, modeling approaches and unique applications with the data from this imaging spectrometer covering the following broad themes but not limited to these only:

1. Ecology: composition, function, chlorophyll, leaf water, lignin, cellulose, pigments, structure, non-photosynthetic constituents.
2. Geology and soils: mineralogy, hydrothermal alteration
3. Coastal and Inland waters: chlorophyll, plankton, dissolved organics, sediments, benthic composition, aquatic vegetation, bathymetry.
4. Snow and Ice Hydrology: snow cover fraction, grain size, dust, impurities, melting.
5. Agriculture: crop type classification, crop health, nitrogen, leaf water, soil composition, soil salinity, soil carbon, abiotic and biotic stresses
6. Biomass Burning: Extent, smoke, combustion products.
7. Atmosphere: water vapor, cloud properties, aerosols, absorbing gases.
8. Environmental hazards: contaminants directly and indirectly, geological substrate.
9. Calibration: aircraft and sensors, sensor simulation, standard validation.
10. Modeling: radiative transfer model validation and constraint.
11. Data Processing Algorithms: atmospheric correction, advance spectra derivation.
12. Human infrastructure

Papers must be submitted electronically to https://www.editorialmanager.com/AISR. To ensure that all manuscripts are correctly identified for inclusion into the special issue, authors must select **"Special Issue: AVIRIS-NG"** when they reach the "Article Type" step in the submission process. Submitted papers must be written in English and should include full affiliation postal addresses for all authors. The general format for submission of papers can be found on the *ASR* Elsevier web site at

http://www.journals.elsevier.com/advances-in-space-research/

Only full-length papers will be considered for publication, subject to peer review by a minimum of two reviewers. There are no page limits although the length of the paper should be appropriate for the material being presented. While the deadline for submissions is **30 June 2022**, papers will be published electronically as soon as they are accepted. The printed issue will be assembled within a reasonable time with late papers being printed in regular issues of ASR. All articles will be typeset at no cost to the author; there is a charge for printing color figures; there is no charge for color figures on the electronic version.

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