

CURRICULUM VITAE

P G DIWAKAR

(Retd. as Distinguished Scientist from ISRO, DOS)

1. **Name** : Dr P G DIWAKAR
2. **Date of birth** : 20 July, 1958
3. **Contact** : Mob No. 9676709898
diwakar@nias.res.in, diwaa6@gmail.com,
diwakar@isro.gov.in,
4. **Academic background:** PhD in Participatory Geomatics, NITK, Suratkal, Karnataka
5. **Current Position** : **ISRO Chair Professor, NIAS & Honorary Distinguished Professor, ISRO HQ**
6. **Important positions held in ISRO**
 - **Head**, Regional Remote Sensing Centre, Bengaluru
 - **Associate Director**, Earth Observation System, ISRO HQ, Bengaluru
 - **Programme Director**, Earth Observation System, ISRO HQ, Bengaluru
 - **Programme, Director**, Disaster Management Support Programme, ISRO HQ, Bengaluru
 - **Deputy Director**, National Remote Sensing Centre (NRSC), Hyderabad
 - **Scientific Secretary**, ISRO, Bengaluru
 - **Director**, Earth Observation & Disaster Management
7. **Specialization** :
 - * Space Technology & Applications
 - * Digital Image Processing
 - * Application Software Design & Development
 - * Geospatial Technology and Solutions
8. **Professional experience** : Significant contributions in Diverse National Missions; Web technologies & GeoPortals; Image Processing solutions; Software Design & Development - Geospatial Applications.
9. **Accomplishments in Space Technology Applications**
 - A. *Wide range of Space Applications and National Missions were taken up as a leader, and was responsible for Design, Development and Deployment of user-specific Geospatial Technological Solutions to meet the end-user requirements.*

- B. As Director, Earth Observation Applications & Disaster Management Support Program Office, was responsible for providing overall direction to Applications and User Services, and also in addressing variety of user applications programmes and in providing specific solutions of national interest, including Disaster Management Support.
- C. One of the key areas of contribution is in the design, development and deployment of a unique and the only Geoportals of National reckoning, **"THE BHUVAN GEOPORTAL"**. Played a key role in leading a professional ISRO team, in successfully accomplishing the task in a short time. Bhuvan is a prominent National Geospatial Platform today.
- D. The design of Bhuvan is done in such a manner that it serves as a versatile platform with simple-to-use features, such as, (1) Visualization of Satellite Imagery and Maps (2) Analytics (3) Free Data Download, and (4) Report Generation tools. The Satellite Imageries are of Multi-sensor, Multi-platform and Multi-temporal nature and can be viewed in 2D and 3D modes through simple tools. Varieties of thematic maps are hosted for analysis of various natural resources themes, to name few, Multi-temporal Landuse, Wastelands, Agriculture and Soil, surface and ground water, Forest & Biodiversity, Ocean, Energy, Rural and Urban. Also the platform is made so versatile that any user requirement could be quickly configured and personalized for a Ministry/ State Government in a very short time. Due to such capabilities today Bhuvan hosts dedicated platforms for various ministries. To name a few, Ministry of Rural Development for MGNREGA and IWMP programs, Ministry of Urban Development - NUIS/ AMRUT & PMAY, Ministry of Forests, Environment & Climate Change – Forest Fires and Forest maps; Ministry of Earth Sciences – IMD & INCOIS services; Telangana Water Resources Information System; Karnataka Forest management services many more.
- E. Due to the vision of building a highly adaptable platform and due to the ease of hosting any type of geospatial service on the platform, Bhuvan has gained unique importance and has proved to be a one-stop-shop for all types of geospatial data and information. Following are a few highlights of the uniqueness of the services being offered.
- i. Nationwide seamless Ortho-corrected images with variable zoom option and support up to 1m spatial resolution
 - ii. Cartosat stereo image based Digital Elevation Model tiles of the entire country, with 30m spacing, for downloads
 - iii. Thematic data services for land, water, ocean and many more
 - iv. More than 10 Million Points of Interest (POI) data
 - v. Facility for Free download of satellite data and geophysical products
 - vi. Customized applications for inventory of assets of any defined entity, planning, implementation and monitoring for e-Governance being used by Central and State Governments in various sectors.

- vii. *Enabling of Web Map Services (WMS) for maps based analytics, which are being consumed as a service by many organizations.*
 - viii. *Near real-time Disaster Management Support services in the country. Time Series Data and information related to Flood, Cyclone, Landslides, Forest Fire Alerts, Drought, Earthquake, and other hazards are hosted based on the events that effectively used by Central & State Ministries*
- F. *One of the recent Applications that was enabled on the platform “Jal Shakti Abhiyan”, that served more than 1000 Blocks in the country for ground water recharge structures, taken up in distress districts, to rejuvenate ground water aquifers in the country.*
- G. *In addition, as team leader for many important initiatives of ISRO, designed applications software and geospatial solutions to accomplish important national missions.*
- *Locale-specific GIS for the Village Resource Centre programme;*
 - *Optimal Fertilizer management using Geospatial solution “GeoFARMS”;*
 - *Biodiversity Characterization at Landscape level “BioCAP”;*
 - *“Island Information System” – geoportal depicting all islands and their attributes*
 - *Established National level GIS for use at Planning Commission, New Delhi;*
 - *Tsunami Disaster Management System for Tamilnadu - Rapid GIS solutions;*
 - *Bhuvan Geoportal - Design, Development and Operational Setup; (Today the geoportal provides wide varieties of solutions with 100s of GIS layers*
 - *Sujala Watershed Development Program – Participatory-GIS solution for Planning & Monitoring, including Participatory GIS at Field Level;*
 - *Setup National Geospatial Database and Applications for NRSC, Mauritius;*
 - *Integrated Mission for Sustainable Development (IMSD);*
 - *National Natural Resources Information System (NRIS);*
- H. *Played a lead role and was responsible for administering the implementation of more than 100 Applications emerging out of National meet initiatives of the Government; Operationalisation & monitoring of major national missions on Bhuvan Geoportal, namely, TWRIS, Bhujal, MGNREGA, IWMP, Postal-GIS, Election-GIS for AP, Near Real-Time Disaster Management Support, Operational services from National Database for Emergency Management (NDEM) geoportal, AMRUT-Geospatial solution for Urban Development, Natural Resources Monitoring-Landuse, Wastelands, Land-Degradation, Ground-Water etc.*
- I. *Also, Key role in setting up Energy Portal for NITI Aayog; Key role in conceptualization and Design of National level Emergency Response Center for Major Disasters.*
- J. *Made significant contributions, as Board Member, for International Charter “Space & Major Disasters”. Took a very important initiative to setup an “ISRO Data Processing Platform for providing global Information Products”. In a short-time a useful initiative was successfully designed and developed. A prototype solution was also demonstrated*

to the Board, International Charter on Space & Major Disasters. The facility could soon serve the global community for all major disasters using Indian and Global satellite data.

- K. A New initiative was taken in administering a set of unique Applications, using India's first Hyperspectral Satellite Mission – HySIS. Newer possibilities using hyperspectral image data from space in many new applications area is the key element in this.*
- L. Administered, an ISRO Platform on Artificial Intelligence and Big Data analytics, that uses Machine learning and Deep Learning technique for problem solving.*
- M. Geospatial solution for Fishermen Community using NavIC devices, which works on Mobile platforms that are already being used by the fishermen community.*

10. International Initiatives:

- **Committee of Earth Observation Satellites (CEOS)** – Primary point of Contact from ISRO. Responsible for representing ISRO in this forum for about 8 years. ISRO to chair CEOS in 2020 and conduct Virtual Plenary during October 2020
- **International Charter “Space and Major Disasters”**: Held the position of Board member (representing ISRO) for more than a decade. Involved in key decisions and also setting up a unique disaster data processing platform at SAC, Ahmedabad, to serve global community.
- **UN-ESCAP**: Primary point of contact, representing Chairman, ISRO, in this forum for more than a decade. Responsible for key decisions and providing ISRO support for sustainable development goals for the Asia Pacific Region.
- **APRSAF – JAXA**: Primary point of contact from ISRO for propogating Space Applications in this forum and also key member in Space Applications Working Group. Many new initiatives launched from ISRO to promote newer space applications in the forum
- Bilateral coordination with many key space faring nations in space sector and Earth Observation related matter

11. Important Awards/ Honors

- **ISRO Team Excellence Awards** - 4 awards for major national missions
 - Agriculture - CAPE,
 - Water (WRIS),
 - Village development (VRCs),
 - Bhuvan Geoportal
- **ISRO Merit award** - for innovative use of space technologies in societal development
- **ISRO Performance Excellence Award for 2019**

- **Astronautically Society of India (ASI) Award for Development of “Bhuvan Geoportal”**
- **National Gold Award** for “Innovative usage of technology and e-Governance”.
- **Globe Forum award**, “Globe Sustainability Research Award 2010”, Stockholm, Sweden
- **Geospatial Excellence Award**, Kaulalumpur, Malaysia
- **National Geospatial Award**, Indian Society of Geomatics
- **ISRO-ASI Award** for “Space Science & Applications”
- **ISRS Award “BHASKARA Award”**
- Conferred “**The Fellow of Indian Society of Remote Sensing**”
- Conferred “**Distinguished Alumnus of NITK, Suratkal**”

12. More than 100 publications / Technical reports

13. Important publications

- *“Geospatial applications in Tsunami disaster management”, International Journal of Ecology & Development, Vol 12, W09, Winter 2009*
- *“An Approach to Multimodal Satellite Image Registration using Particle Swarm Optimization”, Proceedings of the ICEAE 2009, 1495 - 1499.*
- *Space technology based study of climate change impacts on agricultural water foot-prints in a hydrological basin’ – In the proceedings of International workshop on ‘Impact and Climate Change on Agriculture (ICCA) – 2009’ jointly organized by ISPRS WG VIII/6, GED AG-07-03 & ISRS at SAC, Ahmedabad during Dec. 17-18, 2009.*
- *“Flood Assessment using Satellite Image”, Proceedings of the twenty fifth annual in-house symposium on space science and technology, IISc Bangalore, January 29-30, 2009.*
- *“Automatic satellite image registration using Discrete Particle Swarm Optimization”, National Symposium on Advances in Geo-spatial Technologies, Nagpur September 17-19, 2009.*
- *“Flood Assessment using SAR image based on Swarm Intelligence”, National Symposium on Advances in Geo-spatial Technologies, Nagpur September 17-19, 2009.*

- *“Assessment of flood-prone region using high-resolution satellite images”, XXVIII INCA International congress on collaborative mapping and space technology, Ahmedabad, 2009.*
- *‘ICT and Geomatics as process tools for community centric watershed development’, Journal of Geomatics, Vol 4, No. 1, April 2010*
- *“Hyperspectral Image Processing for Agricultural Data”, in the Proceedings of the twenty sixth annual in-house symposium of IISc, Bangalore, on space science and technology, January 2010.*
- *“Satellite Image Registration using Nature Inspired Techniques”, Journal of Intelligent Computing, Special Issue on Evolutionary Algorithms: A Tool for System Design, Vol. 2(4), 2011, pp. 183-194.*
- *“Multi-Spectral Satellite Image Classification using Glowworm Swarm Optimization”, in the Proceedings of the IEEE International Geoscience and Remote Sensing Symposium 2011 (IGARSS 2011), pp.47-50*
- *“An approach to Multi-temporal MODIS Image analysis using Image classification and segmentation”, Advances in Space Research, Vol. 50, No 9, 2012, pp. 1274 - 1287.*
- *“Hierarchical Clustering Algorithm for Land Cover Mapping using Satellite Images”, IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS), DOI 10.1109/JSTARS.2012.2187432, Vol. 5, No. 3, 2012, pp. 762 – 768.*
- *“Multi-objective genetic algorithm for efficient point matching in multi-sensor satellite image”, in the Proceedings of the IEEE International Geoscience and Remote Sensing Symposium 2012 (IGARSS 2012), pp. 1761 - 1764.*
- *Integration of speckle de-noising and image segmentation using Synthetic Aperture Radar image for flood extent extraction, Journal of Earth System science, Vol 122, No 3, June 2013*
- *Multi-temporal Satellite Imagery for Flood Damage Assessment, Journal of the Indian Institute of Science VOL 93:1 Jan.–Mar. 2013*
- *“International charter support during major flood disasters in india”, The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XL-8, 2014 ISPRS Technical Commission VIII Symposium, 09 – 12 December 2014, Hyderabad, India*
- *Multi-temporal Satellite Image Analysis Using Gene Expression Programming, Proceedings of the second International Conference of soft computing for problem solving,*

Advances in Intelligent Systems and computing 236, DOI: 10.1007/978-81-322-1602-5_109; Springer India, 2014

- *Kedarnath flash floods: a hydrological and hydraulic simulation study*, *Current Science*, Vol 106, No. 4, 25 Feb 2014,
- *Debris volume estimation and monitoring of Phuktal river landslide-dammed lake in the Zaskar Himalayas, India using Cartosat-2 images Landslides* DOI 10.1007/s10346-016-0749-8 Received: 9 May 2016 Accepted: 18 August 2016 © Springer-Verlag Berlin Heidelberg 2016
- *Agricultural Drought Assessment in India: Geospatial approach*. *Indian Journal of Meteorology* (Accepted for Special Issue, Jan 2016)
- *Monitoring of Fire incidences in Vegetation types and Protected Areas of India: Implications on carbon emissions* (*Journal of Earth System Science*: under review, 2016.).
- *Development of deforestation and land cover database for Bhutan (1930-2014)* (*Environmental Monitoring and Assessment*: under review, 2016).
- *Monitoring of forest fires from Space – ISRO’s initiative for near real time monitoring of recent forest fires in Uttarakhand* (*Current Science*: 110: 2057-2060; 2016).
- *Predictive modeling for the spatial pattern of past and future forest cover change in India* (*Journal of Earth System Science*: 2016).
- *Development of national database on long-term deforestation in Sri Lanka* (*Journal of Indian Society of Remote Sensing*: 2016).
- *Nationwide assessment of forest burnt area in India using Resourcesat-2 AWiFS data* (*Current Science*: 2016).
- *Geospatial assessment of Long-term changes in Carbon stocks and fluxes in forests of India (1930-2013)* (*Global and Planetary Change* 143: 50-65, 2016).
- *Quantification and monitoring of deforestation in India over eight decades (1930-2013)* (*Biodiversity and Conservation* 25: 93–116; 2016).
- *Development of national database on long-term deforestation (1930-2014) in Bangladesh* (*Global and Planetary Change* 139: 173-182; 2016).
- *Alarming recession of glaciers in Bhilangna basin, Garhwal Himalaya, from 1965 to 2014 analysed from Corona and Cartosat data*; *Geomatics, Natural Hazards and Risk*, ISSN: 1947-5705, July 2017

- *Multi-incidence angle RISAT-1 Hybrid Polarimetric SAR data for large area mapping of maize crop – a case study in Khagaria district, Bihar, India, ISSN: 0143-1161; July 2017*
- *Updated inventory of Glacial lakes in Teesta Basin using Remote Sensing data for use in GLOF Risk Assessment, Journal of Indian Society of Remote Sensing, ISSN 0255-660X, Aug 2017*
- *Development of Spatial database on Intact Forest Landscapes of India (Global and Planetary Change 148: 131– 138), 2017*
- *Predictive modelling for the spatial pattern of past and future forest cover changes in India (Journal of Earth System Science DOI 10.1007/s12040-016-0786-7), 2017*
- *Nationwide assessment of forest burnt area in India using Resourcesat-2 AWiFS data (Current Science 112: 1521-1532), 2017*
- *Monitoring of Fire incidences in Vegetation types and Protected Areas of India: Implications on carbon emissions (Journal of Earth System Science DOI 10.1007/s12040-016-0791-x), 2017*
- *Updated Inventory of Glacial Lakes in Teesta Basin Using Remote Sensing Data for Use in GLOF Risk Assessment, Journal of the Indian Society of Remote Sensing, ISSN 0255-660X , J Indian Soc Remote Sens DOI 10.1007/s12524-017-0699-1*
- *Alarming recession of glaciers in Bhilangna basin, Garhwal Himalaya, from 1965 to 2014 analysed from Corona and Cartosat data, GEOMATICS, NATURAL HAZARDS AND RISK, 2017 <https://doi.org/10.1080/19475705.2017.1339736>*
- *Multi-incidence angle RISAT-1 Hybrid Polarimetric SAR data for large area mapping of maize crop – a case study in Khagaria district, Bihar, India, INTERNATIONAL JOURNAL OF REMOTE SENSING, 2017 VOL. 38, NO. 20, 5487–5501 <https://doi.org/10.1080/01431161.2017.1338783>*