

# Curriculum Vitae

**Dr Ashwagosha Ganju**

**Former Director**

**Defence Geoinformatics Research Establishment.**

**Erstwhile (Snow & Avalanche Study Establishment)**

**Defence Research & Development Organization**



2025

## **Ashwagosha Ganju**

Former Director

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**Date & Place of birth:** 14 Feb 1958; Srinagar (Kashmir)

### **Education:**

- PhD: 2019 "Reconstruction of Late Quaternary Environment by Optical Stimulated Luminescence Dating of Landforms of Nubra and Shyok Valley, J&K, India".
- Masters with Honors in Geology from Punjab University Chandigarh, India (1982). 1<sup>st</sup> Div.
- Bachelors in Geology (Hons) from Punjab University Chandigarh, India (1981). 1<sup>st</sup> Div.

### **Professional Accreditations:**

- Member & Chairperson: India Society of Remote Sensing, Chandigarh Chapter (2009)
- Member, Administrative Staff College of India, Hyderabad (2007)
- Member, Indian Science Congress (2010)
- Member, Indian National Cartographic Association (2011)
- Member & Chairperson Aeronautical Society of India (2011/2015)
- Member & Chairperson, India Meteorological Society, Chandigarh Chapter (2012-14, 16-18)
- Member, Hyper Spectral Big Data Initiative. DST
- Member, Research Advisory Committee of ESSO-NCAOR, (2015)
- Member, PRAGYA, NGO for Development without Destruction and Empowerment for Enabling Choices
- Member, Project Advisory Council- Himalayan Glaciology- (2012-2019)
- Member CRIKC.
- Member & Chairperson: Technical Expert Committee (TEC) Meeting for the Research Vertical "Landslide, snow and avalanche studies" of DIA-CoE, IIT Roorkee (2023-2025)

### **Work Experience: 32 Years**

As University Grants Commission (UGC) Research Scholar studied geo-chemistry of carbonate rocks in Peninsular India at Mysore University, Mansa Gangotri, Karnataka, India. In 1985 at SASE pursued Cold Regions Science and Engineering related work. Gained proficiency in Snow Science, Avalanche Forecasting, Triggering of Avalanches, Snow Hydrology, Glaciology and Remote Sensing Application of Snow. Build expertise on advice to the Army on science and technology, establishing camps in avalanche prone areas, structural control of avalanches,

training on avalanche safety & rescue and route selection in snow bound avalanche prone areas. Carried out studies on the Siachen Group of glaciers from 1985 to 1992.

### **Mar 2019 to Jul 2024:**

Provided consultancy service to RMSI Private Limited on development of Model for prediction of avalanches in Northwest Himalaya. Chairperson Technical Expert Committee (TEC) on the Research Vertical "Landslide, snow and avalanche studies" of DIA-CoE, IIT Roorkee (2023-2025)

### **August 2009 to Feb 2018:**

Director, Snow & Avalanche Study Establishment, Defence Research & Development Organization.

#### **Initiated projects:**

1. Avalanche Forecasting (**Anuman**),
2. Slope Scale Spatial Variability of Mechanical properties & Acoustic Emission Responses from Himalayan Snow Cover (**Him Tarang**)
3. Prediction of Accurate Regional Weather for Army in Mountain Terrain (**PARWAT-Central**)
4. Instrumented Air-Borne Platform for Real-Time Snow cover, Avalanche and Glacier Terrain Monitoring (**IABP**)
5. Development of a wireless pervasive system for monitoring micro-climate and avalanches using sensor network (**AWSN**)
6. SASE Tableau on 'Saviors of Snow Related Hazards on 26 Jan 2012
7. Study on the Impact of Climate Change in Karakoram Mountain and its effect on the Habitation and Mobility of Troops. (**Him Parivartan**)
8. Micro Pile Design for Avalanche Control Structures. (**MACS**)
9. Energy for space heating. (**Geothermal**)
10. High Resolution Avalanche Forecasting and Visualization (**Him Sandesh**)
11. Development of lightweight unmanned instrumented vehicle for snow study (**SROV**)
12. Rotary Upper Air System for Snow Cover Study 2016
13. **Avaline**: Web Enabled Avalanche Forecasting & Dissemination System 2018
14. **Jal Vayu**: Effect of Climate Change on the Cryospheric Region of Himalaya. 2017.
15. **ATEX**: Artificial Triggering of avalanches using explosives. 2018
16. **Anshankan**: Calibration of snow met equipment. 2016
17. **ALCOS**: Low-Cost weather stations for collection of data from high altitude regions of Himalaya. 2016
18. **HIM SANKET**: Acoustic sensor network for snow slope stability assessment 2018

### **August 2005 - July 2009:**

Joint Director in Snow and Avalanche Study Establishment. Studied spatial and temporal variability of snow cover in western Himalayan region (Him Vividhita)

**Completed project on:**

1. Avalanche Forecasting – 2000. Developed statistical and AI based models for prediction of avalanches in different snow climatic zones of western Himalayan region. **(AF-2000)**
2. Spatial & Temporal Variability of Snow in Western Himalaya for assessment of snow cover variability on prediction of avalanches **(Him Vividhita)**.

**Highlights:**

1. Initiated Parwat Central (Project on Central Himalaya)
2. Organization of National Snow Science Workshop
3. Preparation of Multi-Media CDs on Avalanche Safety & Rescue
4. Organization of ISSA
5. Established Virtual Reality Center & Model Room
6. Prepared SASE Mural at SASE, Manali during ISSA
7. Established Avalanche Display Hall at Manali
8. Invitation from CAA, Canada for paper presentation in Wksp. at Vancouver.
9. Cold Region Technology Evaluation Team: Study tour to Alaska
10. Antarctic Study: Study tour to Antarctica

**August 2000 - July 2005:**

Principle Coordinator, Mountain Meteorology Program for prediction of mountain weather forecast on mesoscale for safe movement of troops in western Himalayan region. The participating agencies were India Meteorological Department (IMD), National Center for Medium Range Weather Forecasting (NCMRWF), India and Indian Army for the development of weather prediction model.

**Completed Project on:**

1. Prediction of Accurate Regional Weather for Army in Mountain Terrain and the development of models for the prediction of weather in western Himalaya on Meso-scale (PARWAT)
2. Developed multi-media training material on avalanche safety, artificial triggering of avalanches, classroom lectures on avalanche forecasting, avalanche-awareness, and avalanche accidents.

**Highlights:**

1. Kargil area reconnaissance & avalanche registration.
2. Organization of Users Meet & Workshop.
3. Organization of National Snow Science Workshop
4. Preparation of Avalanche Safety Booklets
5. Publication of Avalanche Accident Analysis Book
6. Preparation of Multi-Media CDs on Avalanche Safety
7. Avalanche reconnaissance & registration of SSH area.
8. Avalanche accident analysis & re-establishing of affected sites in SSH.
9. Organization of ISSMA
10. Established HRPT Station
11. Established Avalanche Terrain Model of Western Himalaya Manali
12. Prepared SASE Mural at RDC, Chandigarh
13. Established Avalanche Display Hall at Chandigarh
14. Completed project AF-2000, PARWAT successfully.

## **November 1985 – July 2000:**

Worked as Team Commander, Siachen area. Imparted training through classroom lectures and field work on avalanche awareness to troops at Base Camp. Developed Nearest Neighbor Model for prediction of avalanches in glaciated regions. Conducted artificial triggering of avalanches and passed on expertise to troops. Reconnaissance of the Siachen Group of glaciers to identify safe routes and campsites. Snow hydrological and sediment transport studies in Siachen Glacier. Interacted with Swiss scientists and obtained on job training in avalanche forecasting at Davos, Switzerland.

### **Highlights:**

1. Reconnaissance of Siachen Glacier
2. Establishing of Observatory Network in Siachen
3. Establishing SASE TASK FORCE, Base Camp, Siachen
4. Artificial Triggering of Avalanches in Siachen
5. Development of Snow Cover Model
6. Development of Contributory Factors Avalanche Prediction Model: Lab Cash award.
7. Preparation: Siachen Atlas
8. Winter Field Work: Deputation to Switzerland for on job training in avalanche Prediction

### **Completed project:**

1. Snow & Avalanches Study along the Manali-Leh axis.

### **Major contribution**

- Development of qualitative avalanche forecast model (Contributory Factors)
- Development of statistical avalanche forecast Model (Nearest Neighbor)
- Development of snowpack build-up approach of avalanche prediction (SPBU)
- Development of multi-media training material for training troops (Annex A)
- Established Observatory Network in Siachen Area
- Prepared Avalanche Atlas of Siachen Glacier
- Prepared Avalanche Display Hall, Avalanche Terrain Model, Avalanche Mural

### **Contribution in Projects, other than DRDO**

-Gangotri Glacier Study (DST Project). The Study of Atmospheric and Avalanche parameters for Gangotri Glacier'. Budget: Rs. 78.34 Lakh [No. ES/91/03/2006 dated 14 Nov 2009, PDC: 14 Nov 2011].

-Micro Tremor Project (Siachen) (DST Project) Seismicity monitoring around Karakorum fault through seismic network in Siachen Region.

### **Major strategic reports prepared:**

- Avalanche Mitigation in Dras-Kargil Area
- Avalanche Mitigation in SSH Area
- Avalanche Mitigation in Siachen Area

## **Awards:**

- Best Performance Award (1990)
- Siachen Medal (1992)
- Science Day Medal (2004)
- Best Science Article in Hindi (2004)
- HR Leadership Award (2012)
- Defence Technology Spin off Award (2013)
- Best Citizenship Award (2014)
- Best Exhibition Award (DRDO Pavilion), ISC-2104

## **Training Courses Attended:**

- Avalanche dynamics & Avalanche Hazard Mapping, Nov 2010. HQ, SASE Manali
- Snow Characterization Training Workshop, 13-15 April 2009. HQ, SASE Manali
- ISE- XXVIII, Antarctic, Summer Study, 03 Jan- 02 Apr 2009. Antarctica
- Mentoring & Career Mapping, 11-13, August 2008. ASCI, Hyderabad
- Tendering & Contracting 10-14 Dec 2007. NIFM Faridabad
- Right to Information Act, 22-23, Nov 2007. YC Academy of Dev Admin, Pune
- Leadership & Managerial Excellence, 10-15, Jul 2006. XIMB, Bhubaneswar
- Oracle Data Base Management & Administration, 01-23, Oct 2002, STG, Chandigarh
- Training in Team Building, 24-29, Jun 2002, ITM Mussoorie
- Training on Avalanche Forecasting, 16 Mar-16 Sept 1995. SLF, Switzerland
- Science in the Service of Soldier Exhibition, 23 Jan-03 Feb 1991. Pragati Maidan, N Delhi
- Training on High Altitude Warfare and Ice Craft, 10-15 Feb 1987. HAWS, Sonamarg
- Ice & Snow Hydrology Training, UNESCO, 14 Mar- 01 Apr 1986. HQ, SASE, Manali
- Advanced Leadership Program, IIM, Ahmadabad, 14-18 Sept 2011

## **Visits Abroad:**

- On job training to SFISAR, Davos, Switzerland (1995)
- Science & Technology Team to Alaska, USA (2006)
- Invited Speaker on Avalanches in India, Vancouver, Canada (2007)
- Summer Team Member in 28th Expedition to Antarctica (2008)
- Cryosphere Simulation Laboratory, Shinjo, Japan Oct 2011
- JWG, Member for Cryospheric Study Group of DST, Berne, Switzerland (2012)
- Project Review Team of SASE, Davos, Switzerland (2012)
- Project Review Team & Workshop, University of Edinburgh, UK (2013)
- Member, SAARC Team to Kabul Afghanistan (2014)

## **Miscellaneous:**

Organized the following Workshops/Symposium/Brainstorming/Conclave:

- CAR AeRO-2015: National Symposium on Careers and Opportunities in Aerospace Defence Technologies.
- TropMet (2015): Chairperson LOC, National Symposium on "Weather & Climate Extremes" Feb 15-18, Chandigarh
- DRDO Exhibition in 101 Indian Science Congress 03-07 Feb 2014. Bagged 1<sup>st</sup> Prize.
- Structure Property Relations: from 3D Imaging to Computational Modeling (2014)
- ReMount (2013): Renewable Energy System for Mountains: Issues and Challenges
- Avalanche and other Mountain Hazard Related Problems-Users Perspective-2013 at Old Airport, Srinagar, Kashmir
- International Workshop on Icing and De-Icing Techniques in Cold Regions (2012)
- International Symposium on Cryosphere & Climate Change ISCCC- (2011)
- International Symposium on Snow & Avalanches (ISSA) at Manali in 2010

- National Snow Science Workshop (NSSW) at Chandigarh in 2008
- International Symposium on Snow Monitoring & Avalanches (ISSMA) at Manali 2004
- International Snow Science Workshop (ISSW) at Manali in 2002
- National Meet on 'How to meet the user's requirement of combating avalanche threat in mountainous region' 2000.
- National Snow Science Workshop (NSSW) at Manali in 1999
- Brainstorming on "How to Improve Avalanche Forecasting" at Manali in 1997
- International Snow Symposium (SnowSym) at Manali 1994
- Engineers Conclave-2014. Theme Coordinator: Technologies for Hilly Regions.

### **Organized the following Courses & CEP from 2000 regularly:**

- Courses on avalanche safety and rescue for troops at various places in the western Himalayan region
- Continued Education Programs (CEP) on combating avalanches for the scientists and staff of Snow and Avalanche Study Establishment
- Dissemination Workshops for troops deployed in snow bound avalanche prone areas in western Himalayan region.

### **Publications:**

		<b>National</b>	<b>International</b>
- Journals	-	12	26
- Symposiums	-	03	15
- Seminars	-	04	-
- Workshops	-	15	03
- Conferences	-	02	03
- Conclave	-	01	-
- Congress	-	02	03
- Brain Storming Sessions	-	01	-
- Books	-	02	

### **Personal:**

- Married; Indian Citizen; Interests include reading and travel.
- Blood group: B+
- Languages: English, Hindi, Kashmiri

### **List of Papers/Publications:**

#### **Conferences/Seminars/Meets/Training/Workshops/Symposium**

1. Ashwagosha Ganju, DK Prashar, Naresh Thakur. 1997. Analysis of Process Oriented Avalanche Forecasting Technique Followed at SASE, Manali, India. **Proc. Workshop on How to Improve Accuracy of Avalanche Forecasting, 24-25 Oct 1997**
2. Ashwagosha Ganju. 1997. Integrated Approach for Improving Avalanche Forecast Accuracy. **Proc. Workshop on How to Improve Accuracy of Avalanche Forecasting, 24-25 Oct 1997**
3. Ashwagosha Ganju, RC Thakur. 1999. Natural Hazards of a Glaciated Region and some Mitigation Methods. **Proc. Symp Snow, Ice and Glaciers. Geol Survey Ind Spl. Pub 53, 2001, 321-325**

4. Ganju Ashwagosha. 2001. Physical processes associated with glaciers. **Proc. of National Academy of Sciences 71 (A), Allahabad. 2001.** Paper presented in **Brainstorming Session on Mathematical Modeling for Glacier studies. Aug 25-26, 2000, Allahabad.**
5. Ganju Ashwagosha, Naresh K Thakur, Vijay Rana. 2002. Characteristics of Avalanche Accidents in Western Himalayan Region. **Proc. International Snow Science Workshop Proceedings Penticton, B.C.**
6. Ganju Ashwagosha. 2002. A GIS based scheme for mapping and forecasting avalanches. Seminar cum Workshop Geographical Information Systems: Geoscientific and Geotechnical Applications: A case study approach. **Centre of Advanced Study in Geology Punjab University, Chandigarh 23-24 Oct 2002.**
7. Srinivasan K, **Ganju A**, Sharma SS, (2003); Usefulness of Mesoscale Weather Forecast for Avalanche Forecasting. Workshop on Mesoscale Modelling for Mountain Weather Forecasting over Himalaya. July 2002, **National Centre for Medium Range Weather Forecasting.**
8. Amreek Singh, **Ashwagosha Ganju** (2003) Earthquakes and Avalanches in Western Himalaya, **Proc. 12<sup>th</sup> Symposium on Earthquake Engineering, Indian Institute of Technology Roorkee**
9. Amreek Singh, **A Ganju**, SK Vaidya (2004); Geohazard potential of Snow Avalanches in Western Himalaya. Proc. National Seminar on Geohazard in Northwest Himalaya, 9-11 Oct 2003. **Bulletin of the Indian Geologists' Association Vol 37(1-2) pp 15-24. Department of Science and Technology, Jammu University. Jammu.**
10. **Ashwagosha Ganju**, Amreek Singh, Jagdish Prasad (2004): A new approach to Avalanche Forecasting and Disaster Management Using a Blend of Conventional Techniques and Modern Technological Tools. World Congress on Natural Disaster Mitigation, **World Federation of Engineering Organizations. The Institution of Engineers (India), New Delhi 19-22 Feb 2004.**
11. **Ashwagosha Ganju**, SS Sharma, Amreek Singh and Naresh K Thakur: 2004. Avalanche Forecasting in Indian Himalaya; Present State and Future Perspective; **presented in Indian Science Congress 03-07 Jan 2004**
12. Amreek Singh, K Srinivasan, **AGanju**.2004. Assessing Avalanche Hazard in Northwest Himalaya using MM5 Forecast; **Proc International Symposium on Snow Monitoring and Avalanches 2004, Manali, India 249-256**
13. Rashpal Kor, **Ashwagosha Ganju** 2004. Indexing and Forecasting of Avalanche in western Himalaya using GIS, **Proc. International Symposium on Snow Monitoring and Avalanches.**
14. Ashok K Keshari and **Ashwagosha Ganju**. 2004. Geospatial Modeling in Decision Making for avalanche Forecasting; **Proc International Symposium on Snow Monitoring and Avalanches, Manali, India.**
15. D Singh, A Singh and **A Ganju**.2004. Observational study on snow covers characteristics and associated avalanche activity in Dras area of Northwest Himalaya. **Proc. International Symposium on Snow Monitoring and Avalanches, Manali, India.**
16. HS Gusain, Amreek Singh, **Ashwagosha Ganju** and Dan Singh .2004. Characteristics of the seasonal snow-cover of Pir-Panjal and Great Himalayan ranges in Indian Himalaya. **Proc. International Symposium on Snow Monitoring and Avalanches, Manali, India.**
17. Ashok K Keshari, Archana Koul, **Ashwagosha Ganju** and Rashpal Kaur.2004. SNOWMET: A processing and statistical analysis module for avalanche forecasting **Proc. International Symp. on Snow Monitoring and Avalanches, Manali, HP 12-16 April 2004**



18. Amreek Singh, P K Satyawali, P K Srivastava, D N Sethi and **A Ganju**.2004. Snow cover Modeling for Indian Himalaya **Proc. International Symp. on Snow Monitoring and Avalanches, Manali, HP 12-16 April 2004**
19. **Ashwagosha Ganju**, NK Thakur. 2006. Snow Avalanche and other Mountain Hazards in Western Himalaya: Prediction and Control. **Proc. in Workshop on Geomorphologic Society of India, Jammu.**
20. **Ashwagosha Ganju**. 2007. Avalanche Threat Evaluation and Mitigation Strategy in Western Himalayan Region. **Workshop on Avalanche Mitigation, Vancouver, Canada**
21. Amreek Singh, **Ashwagosha Ganju**. 2008. Artificial Neural Network for Snow Avalanche Forecasting in Indian Himalaya. **Proc. 12th International Conference of International Association for Computer Methods and Advances in Geomechanics, Goa, India.**
22. Dan Singh, **Ashwagosha Ganju**. 2008. Operational Analog Weather Forecast System for Northwest Himalaya in India. **Proc. National Snow Science Workshop-2008, Chandigarh, India.**
23. Dan Singh, **Ashwagosha Ganju**. 2008. Operational Expert System for Forecasting Avalanches in North-West Himalaya in India. **Proc. National Snow Science Workshop-2008, Chandigarh, India.**
24. Amreek Singh, **Ashwagosha Ganju**. 2008. A New Approach to Analyze Nearest Neighbors for Avalanche Forecasting. **Proc. National Snow Science Workshop-2008, Chandigarh, India.**
25. JC Joshi, **Ashwagosha Ganju**. 2008. Variability of Snowpack Water equivalent and Failure Layer on different aspects of Patsio (HP) in Great Himalaya. **Proc. National Snow Science Workshop-2008, Chandigarh, India.**
26. Sanjeev Kumar. HS Thakur, K Srinivasan, **Ashwagosha Ganju**, Sandeep Kumar. 2008. Verification of Precipitation Forecast of MM5 Model over Northwest Himalaya. **National Snow Science Workshop-2008, Chandigarh, India.**
27. K Srinivasan, Ajay Kumar, MS Shekhar, Harish Chand, **Ashwagosha Ganju**. 2008. Location Specific Precipitation Forecast for Avalanche Forecasting using Model Output Statistics. **National Snow Science Workshop-2008, Chandigarh, India.**
28. HS Gusain, **Ashwagosha Ganju**, Sanjay Vaidya. 2008. An Approach for the Snow Climatic Division of Snowy areas of Lower and Middle Himalaya in India. National Snow Science Workshop-2008, Chandigarh, India. **National Snow Science Workshop-2008, Chandigarh, India.**
29. HS Gusain, JC Joshi, **Ashwagosha Ganju**, Hukum Chand. 2008. Study of Spatial Variation of the Snowpack Structure and Properties with Different aspects in Patsio Bowl, Great Himalaya. Proc. **National Snow Science Workshop-2008, Chandigarh, India.**
30. Amreek Singh, Devi Chand, **Ashwagosha Ganju**. 2008. On the Variability of Snowpack Characteristics in Gulmarg Sector in J&K. **National Snow Science Workshop-2008, Chandigarh, India.**
31. Piyush Joshi, K Srinivasan, **A Ganju**. 2009. Neural Network model for location specific precipitation forecast using MM5 model outputs. **Proc. International Symposium on Snow and Avalanches, 5-10 April 2009**
32. Sanjeev Kumar, H.S.Thakur, K Srinivasan, P Joshi, **A Ganju**, Dinesh Kumar. 2009. Performance of MM5 model during winter months. **Proc. International Symposium on Snow and Avalanches, 5-10 April 2009**
33. M.S.Shekhar, Sanjeev Kumar, Harish Chand, K Srinivasan, **A Ganju**. 2009. Climate change studies over western Himalayan region. **Proc. International Symposium on Snow and Avalanches, 5-10 April 2009**

34. J.C Joshi, **Ashwagosha Ganju** 2009. Study of snow settlement to assess snowpack depth of lower & middle climatic zones of North-West Himalaya. **Proc. International Symposium on Snow and Avalanches, 5-10 April 2009**
35. H.S.Gusain, Devi Chand, Narinder Thakur, Amreek Singh, **Ashwagosha Ganju** 2009. Snow avalanche climatology of Western Himalaya. **Proc. International Symposium on Snow and Avalanches, 5-10 April 2009**
36. K Srinivasan, Ajay Kumar, Jyoti Verma, **Ashwagosha Ganju**. 2009. Prediction of certain meteorological parameters over station location using model output statistics for avalanche threat assessment. **Proc. International Symposium on Snow and Avalanches, 5-10 April 2009**
37. KK Singh, VD Mishra, **A Ganju**, **Sahil Sood** and Vaibhav Sharma (2010), Estimation and monitoring of sea ice concentration and extent around Antarctica using Passive Microwave Satellite data. Paper presented at the ISRS conference Lonawala.
38. Snehmani, Satwant Kaur, **A Ganju**, M R Bhutiyani, A K Nigam (2011). Glacier monitoring and debris-cover mapping using Remote Sensing and GIS techniques - A case study of Gangotri glacier', XXXI INCA Int Congress, 15-17 Oct 2011, PU, Chandigarh
39. Snehmani, Hari Ram RP, **A Ganju**, G Venkataraman, P Thakur, A K Nigam (2011). Application of Full Polarimetric SAR Data for snow Cover Classification: A Case Study of Gangotri Glacier. ICMARS 2011
40. Snehmani, M Chatranta, **A Ganju**, M R Bhutiyani, A K Nigam (2011). 'Modelling the Glacier Sensitivity of Gangotri Glacier, Indian Himalaya', XXXI INCA Int Congress, 15-17 Oct 2011, PU, Chandigarh
41. Snehmani, **A Ganju**, Ankur Pandit, MR Bhutiyani, A K Nigam (2012). 'Glacier movement estimation and Sensitivity modelling using multi-sensor remote sensing data- A case study of Gangotri glacier', Int. Symp on Cryosphere and Climate Change, 02-04 Apr 2012, Manali.
42. Snehmani, Hari Ram RP, **Ashwagosha Ganju**, G. Venkataraman, A K Nigam (2012). 'Polarimetric SAR classification for snow classes using multi-SAR data in Himalayan Mountain', Int. Conf. on Geospatial Technologies and Applications - Geomatrix 2012, 26-29 Feb 2012, IIT Bombay
43. Bhutiyani M. R., R Parsad, MS Shekhar, Sravan Kumar, P Agarwal, **A. Ganju**, Snehmani (2013): Manifestations of Climate Change in Karakoram Himalayas: Extreme precipitation event include earthflow over the Siachen glacier in Nubra valley. Proc. Of International Symposium on Cryosphere and Climate Change, 2 – 4 April, Manali, India, pp. 63-66
44. **A Ganju**, YC Nagar, LN Sharma, PK Satyawali, N Juyal, 2014. Luminescence Chronology of Late Quaternary Glaciations in Nubra-Shyok Valley, Ladakh, India. National Conference on Quaternary Climate Change: New Approaches and Emerging challenges, 15-16 Dec, 2014
45. **Ashwagosha Ganju**, 2014. Mitigation of Mountain Hazards in Snow Bound Regions of Himalaya. Special Lecture in 101 India Science Congress, 2-5 Feb, 2014, Jammu.
46. Amreek Singh, **Ashwagosha Ganju**, 2014. Avalanche Forecasting- An engineering approach. Engineers Conclave-2014, Oct30-Nov01, 2014.
47. **Ashwagosha Ganju**, 2014. Collaboration for Sharing Weather Information and Predictions. Workshop on Mountain Agriculture Assistance Service-Launch Meet 07 Aug 2014.
48. **Ashwagosha Ganju**, 2014. Infrastructure Development Constraints and alternatives under the Climate Change Scenario in the Leh Ladakh Region of India. Seminar Cum Workshop on Geological & Geophysical Problems due to Glaciers, Glaciated Lakes and Cloudbursts on Infrastructure Development in Ladakh Region. 11-12 Nov 2014.
49. **Ashwagosha Ganju**, 2014. Introduction to Avalanches and Safety-Rescue Techniques. SAARC Regional Workshop on Avalanche Risk Management. 07-10 Sept 2014, Kabul.
50. Usha Devi, M S Shekhar, Narinder Kumar, Amreek Singh and **A Ganju**, (2015). A new technique for reconstruction of precipitation values, National Symposium. TropMet-2015.

- 51 H.S. Negi, M.S. Shekhar, H.S. Gusain and **A Ganju** (2015) Changes in winter climate and snow cover over north-west Himalaya, Int. Conf. on Science and Geopolitics of Arctic, Antarctic and Himalaya, 30 Sep 2015, New Delhi.
- 52 H.S. Gusain, V.D. Mishra, M.K. Arora and **A Ganju** (2015)'Estimation of net radiation flux of East Antarctic ice sheet during clear sky days using remote sensing and meteorological data.' Int. Symp Antarctic Earth Science, 13 – 17 July 2015, Marriot Hotel, Miramar, Goa, India.
- 53 Kanav Barotra, H.S. Gusain, Kamal Kumar, Kavita Mitkari, Dheeraj Kumar, M.K. Arora and **A Ganju** (2015) 'Velocity and thickness estimation of Siachen Glacier using optical remote sensing data, Int. Symp. on Antarctic Earth Science, 13 – 17 July 2015, Marriot Hotel, Miramar, Goa, India.

## **Journals**

1. **Ashwagosha Ganju**, PK Satyawali, Amreek Singh, DN Sethi. **1999**. Snowcover Simulation model-A Review. Defence Science Journal, Vol 49, No 5, Oct 1999, pp419- 436.
2. SS Sharma, and **Ashwagosha Ganju**. **2000**. Complexities of avalanche forecasting in western Himalaya- an overview. Cold Region Science and Technology 31 (2000) pp. 95- 102
3. **A Ganju**, A. P. Dimri (**2004**); Prevention and Mitigation of Avalanche Disasters in Western Himalayan Region; Jour. of the International Society for the Prevention and Mitigation of Natural Hazards. Natural Hazards 31: 357-371, Kluwer Academic Publishers, Netherlands.
4. Amreek Singh, **Ashwagosha Ganju**; **2004**: A supplement to nearest-neighbor method for avalanche forecasting; Cold Region Science and Technology 39 (2004) 105-113.
5. Pant L.M. and **Ashwagosha Ganju** .**2004**. Fuzzy rule-based system for prediction of direct-action avalanches. Current Science Vol 87, No. 1,99-104
6. **Amreek Singh**, K Srinivasan and **Ashwagosha Ganju**, **2005**. Avalanche Forecast Using Numerical Weather Prediction in Indian Himalaya, Cold region Science and Technology Vol. 43, 83-92.
7. Dan Singh, **Ashwagosha Ganju**, Amreek Singh. **2005**. Weather Prediction using Nearest-Neighbor Model. **Current Science Vol 88, No 8, April 2005**
8. LM Pant, **Ashwagosha Ganju**. **2006**. Application of Neural Networks for Avalanche Forecasting. Defence Science Journal, Vol 56, No 4, Oct 2006 pp 559-567
9. AP Dimri, **A Ganju**. **2007**. Wintertime Seasonal Scale Simulation over Western Himalaya Using RegCM3. **Pure Appl. Geophysics. 164 (2007) 1733-1746**
10. H S Gusain, K K Singh, V D Mishra, P K Srivastava and **Ashwagosha Ganju (2009)**, Study of surface energy and mass balance at the edge of the Antarctic ice sheet during summer in Dronning Maudland, East Antarctica. Antarctic Science, 21(4), 401-409,
11. MS Shekhar, Sanjeev Kumar, Harish Chand, K Srinivasan, **Ashwagosha Ganju**. **2009** Climate change studies over Western Himalayan region. **Annals of Glaciology, 51(54). 2010**
12. K Srinivasan, Ajay Kumar, Jyoti Verma, **Ashwagosha Ganju**. **2009**. Statistical downscaling of MM5 model output to better assess avalanche threats. **Annals of Glaciology, 51(54). 2010**
13. K K Singh, Prem Datt, Vaibhav Sharma, **A Ganju**, V D Mishra, A Parashar and R Chauhan (**2011**) Snow depth and snow layer interface estimation using GPR. Current Science, 2011, 100(10), pp 1532-1539.

14. M. Sarvana Kumar, MS Shekar, SSVS Ramakrishana, MR Bhutiyani, **A Ganju. 2012** Numerical Simulation of Cloud Burst Event on August 05, 2010, over Leh using WRF Meso Scale Model Natural Hazards, 62(3) 1261-1272. (1.958)
15. M S Shekhar, Ajay Kumar, **A Ganju, 2012**, "Location specific weather forecast", Mausam, 63 (3), 475-478. (0.152) Hindi.
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42. K. K. Singh1, D K. Singh, H. S. Negi, A. V. Kulkarni, H. S. Gusain, **A. Ganju** and Babu Govindha Raj K. **2018**. Temporal change and flow velocity estimation of Patseo glacier, Western Himalaya, India. *CURRENT SCIENCE*, VOL. 114, NO 4, Feb 2018
43. H. S. Negi, Neha Kanda, M. S. Shekhar and **A. Ganju. 2018**. Recent wintertime climatic variability over the Northwest Himalayan cryosphere. *CURRENT SCIENCE*, VOL. 114, NO. 4, 760 FEB 2018.
44. **A Ganju et al. (2018)** Luminescence chronology and climatic implication of the late quaternary glaciation in the Nubra valley, Karakoram Himalaya, India. *Palaeogeography, Palaeoclimatology, Palaeoecology* 502 (2018) 52–62.
45. M.S. Shekhar and **A. Ganju (2022)** Avalanche Phenomena in Northwest Himalaya: A Review. *VayuMandal* 48(2), 2022

### **Books**

1. **Ganju Ashwagosha, Naresh K Thakur, Vijay Rana (2003)**. Avalanche Accidents in Western Himalayan Region, India. A Compilation and an Analysis. Book published in SASE. P177
2. **Ashwagosha Ganju, Piyush Joshi, PK Satyawali (2012)**: Avdhav Dighdarshika.

### Miscellaneous Publications:

- (a) Avalanche Forecasting: Successes and Failures (2000-04)
- (b) Siachen Annual Reports. (Internal Pub.) 2000-2003
- (c) Annual reports of SASE. (Internal Pub.) 2000-2003
- (d) M S Shekhar, S Kumar, Amreek Singh, A Ganju, 2014: Long Period Average of winter precipitation over selected stations of Western Himalaya, SASE (DRDO) Technical report No. DRDO / SASE / TCHD / LPA / 12 / 2014
- (e) SASE Newsletter
- (f) Avalanche safety recommendation for rerouting of 66KVA transmission line from Kothi to Gupha, Manali, HP.
- (g) Report on Feasible Options and Recommendations for Mitigation of Avalanche Hazards between Z Morh and Zoji La Tunnels for All Weather Connectivity along Srinagar-Leh Highway, July 2014.

### • Talks

- **BSIP2013:** Paleo-climatic inferences from the Landforms of Nubra Valley-2013
- **Indian Science Congress-2014:** Mitigation of Mountain Hazards in Snow Bound Regions of Himalaya.
- **PRAGYA-2014,** Workshop on Mountain Agriculture Assistance Service: Collaboration for Sharing Weather Information and Predictions.
- **BRO-2014:** Infrastructure Development Constraints and alternatives under the Climate Change Scenario in the Leh Ladakh Region, India
- **SAARC, Kabul-2014:** Introduction to Avalanches and Safety-Rescue Techniques.
- **CME, Pune-2014:** Landslides and Mitigation Strategy.
- **TropMet-2015:** Mountain Weather, Challenges, and Initiatives.
- **CHESCON-2015:** Mountain Hazards & Mitigations Strategy.
- **PU, Chandigarh-2015:** Make in India: SASE perspective.
- **DRDO HQ-2015:** Geospatial Technologies for Cryospheric Hazards
- **NIAS-2015:** Technologies for Mitigation of Hazards Encountered in the Cryospheric Regions of Himalaya
- **NDMA-2015:** Technologies for Mitigation of Hazards in Cryospheric Regions of Himalaya
- **JNU-2015:** Role of Himalaya in Indian Climate
- **SaGAA-2015:** Changes in climate and snow cover over north-west Himalaya. LIGHTS Research Foundation.
- **PRAGYA-2015:** Climate Change Adaptation in Western Himalaya. International Symposium on Climate Change Adaptation in Asia
- **Amrita University-2016:** Satellites and Sensors for Snow Studies and Avalanche Disaster Management.
- **DIAT-2016:** Snowpack Simulation Modelling
- **SAC-2016:** SAR Application in Cryosphere Studies.
- **IISc-2017:** Natural Hazards in Cryospheric Regions of Himalaya and Mitigation Strategies.
- **PU, Geography Dept.-DST Initiative-2017:** India's Preparedness towards Avalanche Disasters with Special Reference to Northwestern India

- **Collaboration**

- **CRREL:** Snow Harvesting
- **SLF:** Acoustic Emission and Avalanche Dynamic Study.
- **UKIERI:** Computational Modeling
- **NRSC:** Continuously Operated Reference Station (CORS)
- **IIRS:** Water Resource in Himalayan Snow Cover.
- **NGRI:** Seismic Activity and Indian Plate Movement in Karakoram Area.
- **NDMA:** Mitigation of Mountain Hazards
- **SDC-DST:** Capacity building and Climate Change Study

<b>RESEARCH PROJECTS</b>							
<u>Title of the Project</u>	<u>Description</u>	<u>Role</u>	<u>Contribution/Achievement</u>	<u>Status</u>	<u>Report</u>	<u>Duration</u>	<u>Sponsor Authority</u>
Studies on Snow-Avalanches along Manali-Leh Axis	-Registration -Data collection Observatory Installation -Data analysis	PL	-Snow climatic zones -Registration Of avalanches	Success Closed	Yes	1985-1988	DRDO (R&D)
Prediction of Accurate Regional Weather for Army in Mountain Terrain <b>(PARWAT-WEST)</b>	-Est. Obs. -Draw Mountain Weather Forecast -Develop Meso-Scale Model	PD	-Est. 3 UAS -Est. 22 Obs. -Developed Meso-scale Model -Est. MMCs	Success Closed	Yes	2000-2006	DRDO (R&D)
Avalanche Forecasting Model Model <b>(AF 2000)</b>	-Develop Op Forecast Model	PD	-Op Model Developed.	Success Closed	Yes	2002-2007	DRDO (R&D)
Spatial & Temporal Variability of Snow in Western Himalaya for assessment of snow cover variability for prediction of avalanches <b>(HIMVIVIDHITA)</b>	-Establish Variability in Snow cover stability	PD	Variability Factors Identified & Quantified	Success Closed	Yes	2003-2008	DRDO (R&D)
Prediction of Accurate Regional Weather for Army in Mountain Terrain <b>(PARWAT-CENTRAL)</b>	-Est. Obs. Network in Central Himalaya -Register Avalanches -Draw meso Scale forecast	PD	-Obs. Network est. -Est. HPC -Registered Avalanches -Op forecast Issued. -WRF Model Implemented	Success Closed	Yes.	2008-2015	DRDO (IF)
<b>ANUMAN</b>	-Develop Hybrid Model	PD	-Optimization Part complete -Integration is on	Success Closed	Yes	2010-2015	DRDO (R&D)



<b>HIM TARANG</b>	-Test acoustic emissions from snow -Use of non-Invasive Technique for snow Cover stability! -Test Radar technology for snow	Advisory	-Infrasonic Utility established. -Micro pen study completed	Success Closed	Yes	2010-2015	DRDO (R&D)
<b>MICRO TREMOR STUDY OF SIACHEN</b>	-Est. the probable cause of micro tremor in Siachen GL.	PI	-Est. Seismic Stations -Data analyzed	-	-	2010-2015	MoES
<b>PATSIO GLACIER STUDY</b>	-Study Glacier Retreat & Mass Balance	Advisory	-Est. AWS -Est. Retreat -Negative Mass Balance	Success Closed	Yes	2011-2014	DST
<b>HIM SANDESH</b>	High Resolution Avalanche Forecasting and visualization	Advisory	-Project formulation & Monitoring	-	-	2016-2019	DRDO (S&T)
<b>Geothermal</b>	Energy for space heating	Advisory	-Project Execution	Success Closed	Yes	2010-2012	DRDO

- **Other than DRDO Projects: PI/CO-PI**

- **DST:** Dynamics of Patsio Glacier in Great Himalayan Mountain range, India
- **PIRE-** ProSwarm: New initiative of DST with University of Kansas for NSF Project. SASE is a part of the team. Project dropped.
- **IIRS-DOS:** Monitoring and assessment of mountain services and processes in Northwestern Himalaya (NWH)
- **DST:** Estimation of glacier stored water in Karakoram Himalaya.
- **DST:** Glacier mapping and velocity estimation using satellite images.
- **MoES:** Deformation across the Karakoram fault and Kaurik Chango rift and its implication on the NW Himalayan Tectonics
- **MoES:** Seismic and glacier monitoring in Siachen region through seismic network, multi-sensor satellite imagery and ancillary data

- **NISAR:** NASA-ISRO Synthetic Aperture Radar. L&S
- **DST:** Generation of a spectral library of different types of snow and ice media

- **HRD**

- Competency Mapping
- Training Need Identification
- Knowledge Upgradation
- Know Your SASE
- Eureka
- SASE Scientists Club

## **PRESENT & PREVIOUS EMPLOYMENT**

<u>Organization &amp; Address</u>	<u>Position Held</u>	<u>Period</u>	<u>Nature of Duties/Work</u>
1. Research & Development Centre (RDC), Snow & Avalanche Study Est. (SASE), Ministry of Defence, Chandigarh	Scientist H Director	Oct2015 – Feb2018	Research & Techno Management
2. RDC, SASE, CHD	Scientist G Director	Jul2009- Oct2015	R&D, Management
3. RDC, SASE, CDG	Scientist F Jt. Director/ Director	Jul2005- Jun2009	R&D, & Management
4. RDC, SASE, CDG	Scientist E Dy. Director	Jul2000- Jun 2005	R&D, & Management
5. HQ, SASE, Manali	Scientist D Asst. Director	Jul1995- Jun2000	R&D (Avalanche Forecasting)
6. HQ, SASE, Manali	Scientist C	Jul1990- Jun1995	R&D (Avalanche Forecasting)
7. HQ, SASE, Manali	Scientist B	Nov1985- Jun1990	R&D (Avalanche Safety)

- **ISO**

- SASE ISO 9001-2008 Certified Since 2012

**MULTIMEDIA TRAINING MATERIAL PREPARED**

- **Avalanche: 'A User Guide'**
- **'Avdhav Alok Chitra Patrika Surksha Tatha Bachav'**
- **Multimedia 'SASE user's guide'**
- **Multimedia 'Artificial Triggering of Avalanches'**
- **Video 'Artificial Triggering Chowkibal-Tangdhar road axes**
- **User's Guide on controlled Release of avalanches**
- **Multimedia 'Avalanche Accidents (Six Accidents)**
- **Classroom VCD on Avalanche Awareness, Avalanche Forecasting & Artificial Triggering**
- **SASE Cooperate Film**
- **Interactive Multimedia CD, Summit 'X'**
- **Multimedia CD Avdhav-Ek Vipita**
- **Multimedia CD Story of Avalanche**
- **Designed Posters for Users**