A EUROPEAN NETWORK FOR A HARMONISED MONITORING OF SNOW FOR THE BENEFIT OF CLIMATOLOGY, HYDROLOGY AND NUMERICAL WEATHER PREDICTION

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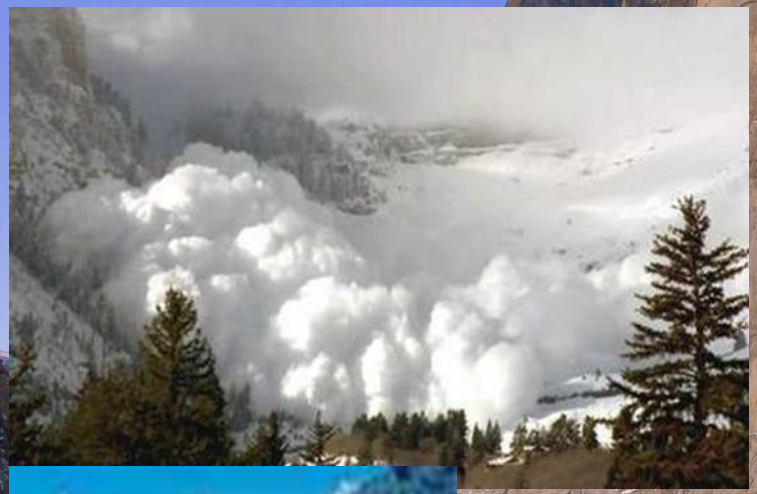

IINTRODUCTION TO COST

COST is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level

What is a COST Action?

- ❑ COST Actions are pan-European, bottom-up science and technology networks open to researchers from academia and industry or to policy stakeholders.

- ❑ COST does not fund research itself, but supports networking activities carried out within COST Actions.

- ❑ Every COST Action lasts for up to four years and requires the participation of researchers from at least 5 COST Member Countries.

INTRODUCTION TO COST ACTION ES1404

This COST Action on SNOW aims at building a better connection between snow measurements and models, between snow observers, researchers and forecasters, for the benefit of various stakeholders and the entire society

AIM OF THE ACTION

To enhance the capability of the **research community** and **operational services** to provide and exploit **quality-assured and comparable** regional and global observation-based data on the **variability of the state and extent** of snow.

Overall Objectives & Benefits

1. **Establish a European-wide science network** on snow measurements for their optimum use and applications benefitting on interactions across disciplines and expertise.
2. **Assess and harmonise practices, standards and retrieval algorithms** applied to ground, air- and space-borne snow measurements => Foster their acceptance by key snow network operators at the international level.
3. Develop **a rationale and long term strategy** for snow measurements, their dissemination and archiving.
4. **Advance snow data assimilation** in European NWP and hydrological models and show its benefit for relevant applications.
5. **Establish a validation strategy** for climate, NWP and hydrological models against snow observations and foster its implementation within the European modelling communities.
6. **Training of a new generation of scientists** on snow science and measuring techniques with a broader and more holistic perspective linked with the various applications.

Scientific Programme

- The Action will scrutinise activities related to snow science in terms of

(1) **observations**, (2) **instrumentation** and (3) **data assimilation**, aiming at better effectiveness, harmonisation and coverage of snow data.

- **Harmonization activities will focus on the critical nodes of the measurement chain.**

- Three WGs will be defined according to the 3 focuses in the scientific programme.

WG1: Physical Characterization of Snow properties

Task 1.1: Identifying and assessing the essential snow variables

Task 1.2: Physical characterization of the essential snow variables

Task 1.3: Snow network optimization, data quality control and homogenization

Task 1.4: Harmonization of snow observations in terms of the measured variables

WG2: Instrument and Method Evaluation

Task 2.1: A review of existing space-borne and ground-based sensors/instrumentation applied for measurement of different snow characteristic, estimation of their uncertainties.

Task 2.2: Guidelines for in-situ snow observations and related training

Task 2.3: Spectroradiometry for snow studies

Task 2.4: Methods to measure snow grain size

Task 2.5: Methods to measure mechanical properties of snow

WG3: Snow data assimilation and validation methods for NWP and hydrological models

Task 3.1: An overview assessment for understanding the future perspectives of how the various snow observations are used in NWP, hydrology and climate studies.

Task 3.2: Development of methods to update non-observed forecasted physical snow properties (such as snow temperature, wetness, density profiles, and mechanical properties) based on the observed ones (such as snow depth and extent).

Task 3.3: Advance in the assimilation of new and developing satellite observations of different snow properties and their combination with conventional in-situ snow measurements.

Task 3.4: Finding ways towards more extended usage of conventional snow observations in NWP, hydrological and climate models, including observations from high-resolution national networks.

Task 3.5: Reaching better knowledge on model and observational errors relevant for data assimilation, by establishing links between model and measurement communities via WG1 and WG2.

Overall of Deliverables

- A web-based overview/data portal of snow observations, measurements and instruments with links to existing real-time snow databases
- A review and practical guide on snow measurements considering different user needs
- A catalogue of snow measurement instrumentation and best practices
- A review on snow data assimilation in European NWP and hydrological models
- Multidisciplinary articles in scientific journals (including above review results)
- A synthesis and strategic recommendations report.

Milestones & Deliverables

Milestones	Deliverables
M1 Establishment of the MC, with nomination of Chair, vice-Chair, Grant-holder, website manager, ESR and Gender monitors. M2 Establishment of WGs and nomination of their leaders and co-leaders. M3 Definition of work plan; schedule and items of WGs' meetings. M4 Definition of 2 Workshops' topics and invitees. M5 Call, evaluation and approval of yearly STSMs for each year. M6 The Action's webpage is operational.	D1 Review report on identifying and assessing the essential snow variables. D2 Summary of physical characterization and harmonized definition of snow variables. D3 Priority assessment of snow characteristics for various applications D4 Handbook on standardized methods for snow data quality control. D5 Assessment of measurement errors and inter-calibration of measurement techniques. D6 Report on spatial and temporal representativeness errors of snow measurements for data assimilation in NWP and hydrological models.

Milestones & Deliverables

Milestones	Deliverables
M7 Questionnaire on measurements and instrumentation completed (i.e. drafted, sent and analysed). M8 Questionnaire on data assimilation techniques completed. M9 Essential snow variables identified. M10 Physical characterization of essential snow variables completed. M11 1st Field campaign for inter-comparison of instruments and exchange of methods completed. M12 2nd Field campaign for testing the developed snow measurements protocols. M13 Links to peer-reviewed papers on international journals written by the Action participants collected to the Action web site.	D7 Peer-reviewed publications on advanced assimilation techniques for NWP and hydrological models D8 Measurement reports and manuals to standardize measurement protocols will be issued based on the field campaign results. D9 Two specific workshop for addressing the different focuses of the Action (1. emphasis on characterization and measurements, 2. emphasis on snow data assimilation in NWP models). D10 Training school on snow measurements and data assimilation organized. D11 Each of the three working groups will produce a review paper by the end of the Action. D12 Final workshop to summarise, promote and disseminate achievements of the Action, and involving users and stake holders.

TIMELINES

Year		Activities/Milestones/Deliverables
1	Q1	• Establishment of MC, with nomination of Chair, vice-Chair, Grant-holder, website manager, ESR and Gender monitors (M1). • Establishment of WGs and nomination of their leaders and co-leaders (M2).
	Q2	• Definition of work plan; schedule and items of WGs' meetings (M3), workshop#1 (M4) and STSMs (M5) • Internal and external web sites are set up for further development (M6) • Design and identification of addressees for the questionnaire on measurements, instrumentation and data assimilation practices (M7)
	Q3	• Plans for participation to 1st field campaign in Year 2.
	Q4	• End of Year 1's review and short reports from WGs meetings, workshop and STSMs.

TIMELINES

Year		Activities/Milestones/Deliverables
2	Q1	• Assessing achievements against work plan: setting new steps for implementing the MoU; • Schedule and items of WGs' meetings, workshop#2(M4) and STSMs (M5) • Analyses of the questionnaires (D1, D2) • Essential snow variables identified (M9) • Plans of training school on snow measurements and data assimilation in Year 3
	Q2	• 1st Workshop (D9) with emphasis on characterization and measurements of snow • 1st Field campaign of snow measurements (M11)
	Q3	• Review report on 1st field campaign (D8)
	Q4	• Preparing plans for 2nd field campaign in Year 3 • End of Year 2's review and short reports from WGs meetings, workshop and STSMs

TIMELINES

Year		Activities/Milestones/Deliverables
3	Q1	• Assessing achievements against work plan: setting new steps for implementing MoU • Schedule and items of WGs' meetings, Final workshop and STSMs (M5) • 2nd Workshop with emphasis on snow data assimilation in NWP models (D9) • Physical characterization of essential snow variables completed (M10)
	Q2	• 2nd field campaign of snow measurements (M12)
	Q3	• Review report on 2nd field campaign including guidelines for in-situ snow measurement techniques and protocol (D8)
	Q4	• Training school on snow measurements and data assimilation (D10) • End of Year 3's review and short reports from WGs meetings, workshop and STSMs

TIMELINES

Year		Activities/Milestones/Deliverables
4	Q1	• Assessing achievements against work plan: setting new steps for implementing MoU • Schedule of WGs meetings, workshops and STSMs (M5)
	Q2	• Report on instrumental and representativeness errors of snow measurements for data assimilation in NWP and hydrological models (D6)
	Q3	• Measurement reports and manuals to standardize measurement protocols will be issued based on the field campaign results (D8)
	Q4	• Final Workshop/Conference with presentation of results to a broad multi-disciplinary audience (D12). • Final reports, guidelines, training or dissemination materials from each WGs (D11) • All links to peer-reviewed papers on international journals written by the Action participants available at the Action web site (M13)

Thank your for your attention!