Overview of INARCH Common Observing Period Experiment (COPE) Status and Activities

Chris DeBeer, INARCH Science Manager

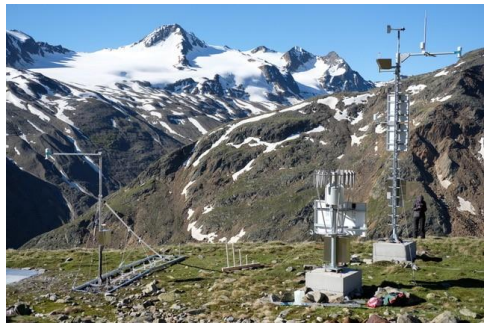
INARCH Workshop, Zhangye, China

October 18, 2024

Common Observing Period Experiment (COPE)

2022–2024

INARCH is conducting a Common Observing Period Experiment (COPE) over the period 2022–2024 to collect high-quality measurements along with supplementary observations and remote sensing campaigns, to produce a common, coherent, and well-documented and described data set of mountain meteorology and hydrology.


Common Observing Period Experiment (COPE)
2022–2024

- 34 INARCH basins actively participating in COPE
- focusing on obtaining high-quality measurements,
- ensure all sensors are working,
- enhance observations at our mountain research basins,
- fly supplementary UAV acquisitions,
- run high resolution models and
- work together for comparison of processes, data sharing, and model testing in challenging environments
- https://inarch.usask.ca/science-basins/cope.php

Common Observing Period Experiment (COPE)
2022–2024

COPE Hydrological, Meteorological, Glaciological Models

1. CRHM
2. openAMUNDSEN
3. OGGM (open global glacier model)
4. Cosipy
5. WRF\NoaaMP\CLM\LES models
6. FSM2
7. Thethys-Chloris
8. SPHY
9. AMelt
10. SNOWPACK/Alpine3D
11. Canadian Hydrological Model (CHM)
12. SnowModel
13. AWSM/iSnobal
14. FSM-OSHD
15. S3M
16. TopoPyScale
17. SURFEX-Crocus
18. SnowMet

- Details of these models are available at https://inarch.usask.ca/science-basins/cope.php
- Modellers will apply their models in as many places as possible to look at differences in results seen with elevation, vegetation structures, climate, etc.
- Forcing data to be available by October 2024, model runs completed by Spring 2025

Model diagnostic evaluations on basins

Model comparisons on basins – not necessarily formal intercomparisons of SWE as has been done in the past, but comparing the results of diagnostic modelling to better understand why models produce various behaviours and to see if models benchmark various known aspects and regimes of the coupled atmospheric-cryospheric-hydrological system

An energy balance snowmelt model in a Mediterranean site

J. Herrero [a], M.J. Polo [b], A. Moñino [a], M.A. Losada [a]

Research papers

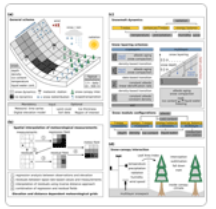
The cold regions hydrological modelling platform for hydrological diagnosis and prediction based on process understanding

J.W. Pomeroy [a], T. Brown [a b], X. Fang [a], K.R. Shook [a], D. Pradhananga [c], R. Armstrong [d], P. Harder [a], C. Marsh [a], D. Costa [e], S.A. Krogh [f], C. Aubry-Wake [a], H. Annand [a], P. Lawford [a], Z. He [a], M. Kompanizare [a], J.I. Lopez Moreno [g]

Model description paper | 12 Sep 2024

openAMUNDSEN v1.0: an open-source snow-hydrological model for mountain regions

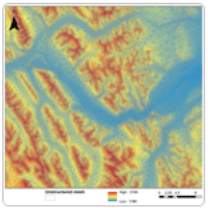
Ulrich Strasser, Michael Warscher, Erwin Rottler, and Florian Hanzer



Model description paper | 29 Jan 2020

The Canadian Hydrological Model (CHM) v1.0: a multi-scale, multi-extent, variable-complexity hydrological model – design and overview

Christopher B. Marsh, John W. Pomeroy, and Howard S. Wheater



Timeline and Next Steps

- We have inventories/updates of activities at basins, measurements, drones & sensors, and models
- We now need to begin to assemble the data
  - Need to consider intended use of the data
    - For statistical analysis of the measurements, then need measurements from the observing stations with only a very basic QA/QC to remove erroneous values. Gaps are left intact as missing data.
    - For running a hydrological model forced by the observations, need gap filled datasets and how the gaps are filled is very important.
  - For models we will want U, Udir, T, RH, P, Kin, and Lin as observed variables.
  - Ideally, we will want both gap filled and original observational datasets for INARCH.
  - Also, we will want diagnostic variables such as streamflow, soil moisture, snow depth & density (SWE), icemelt, surface temperature, and longwave out for model testing and for further description of the hydrometeorology, where this is available.

Timeline and Next Steps

- INARCH Fall workshop in China (Oct 14–18, 2024)
- Model forcing and diagnostic data to modellers by Oct 2024
- Final model runs conducted over Fall 2024 – Spring 2025
- Presentations at conferences:
  i. INARCH session proposed at EGU General Assembly (Apr 27–May 2, 2025),
  ii. International Mountain Conference, Innsbruck (Sept 14–18, 2025) and INARCH Fall 2025 workshop before or after IMC2025,
  iii. AGU Fall Meeting, New Orleans, Dec 15–19, 2025.
- Publications in a special issue of HESS – proposal submitted, to be opened soon and accepting papers until at least end of 2025.
- Special issue of ESSD https://essd.copernicus.org/articles/special_issue871.html can still take new data paper submissions.