Debris-Covered Glacier Working Group:

# Melt model intercomparison data requirements

Goal is to provide as complete a dataset as possible, with data providers choosing the most appropriate data quality control (QC) and replacement procedures for their site. Therefore, we seek gap-filled, ready to use data with complete metadata on prior handling procedures.

## 1) **Meteorological forcing data** from AWS installed on debris covered ice

- Minimum *one full melt season*, ideally one complete (hydrological) year of data.
- Measurements at known height.
- Measurements delivered at the highest available frequency, as well as at 60 minute intervals or averages.
- If only one or two of the variables are missing, please consider submitting your site with a 'best replacement' variable timeseries from an alternative source and an explanation of it.
- Please assign your AWS an ID (e.g. Suldenferner: SDF)
- Data as .csv named 'AWSID_YYYY_mm.csv' where YYYY is the year of the data collection and mm is the time increment in minutes (e.g. Hourly data from Suldenferner: SDF_2016_60.csv). Note that if you are providing a dataset spanning multiple years then replace YYYY with an 8 digit code containing start and end year.
- For stations drilled into ice, the sensor height will change both positively and negatively with ablation and accumulation; for tripod stations sensor height will only change during burial by snowfall.

- Provide meteorological variables as columns in the .csv file follows:
  - YEAR: year (YYYY)
  - MONTH: month (MM)
  - DAY: day of month (DD)
  - HOUR: hour (HH)
    - midnight as 24$^{th}$ hour of given (preceding) day rather than 0$^{th}$ hour of subsequent day
  - MINUTE: minute (MM)
  - T: Air temperature (°C)
  - RH: Relative humidity (%)
  - FF: Wind speed (m s$^{-1}$)
  - DIR: Wind direction (°)
  - P: Air pressure (hPa)
  - SWIN: Incoming SW (W m$^{-2}$)
  - SWOUT: Outgoing SW (W m$^{-2}$)
  - LWIN: Incoming LW (W m$^{-2}$)
  - LWOUT: Outgoing LW (W m$^{-2}$)
  - PP: Precipitation (mm total over time increment)
  - SNOW: Snowdepth (m)
  - T_z: Height of air temperature measurement (m)
  - RH_z: Height of relative humidity measurement (m)
  - FF_z: Height of wind measurement (m)

Provide accompanying metadata for the AWS including:

- glacier name
- photograph
- GLIMS ID / RGI ID
- latitude/longitude / elevation
- UTM zone
- datalogger used
- period of data coverage
- highest frequency of data available
- format of timestamp (UTC or Local Time (LT))
- sensors installed
- details of any QC checks performed
- details of any data replacement or infilling procedures applied
- estimated % error on each variable, and stated reason

**2) Best estimates of debris properties** at AWS site

We accept this is difficult for many sites. Measured data are preferred, otherwise careful choices or modifications of values from the most appropriate published data are suggested.

- h_d: Thickness of debris cover (m)
- z0: Local surface roughness estimate (m)
- k: Bulk thermal conductivity of debris cover
- phi: estimate of debris cover porosity
- emissivity
- lithology

**3) Validation data** in the form of as many of the following as possible:

- automatic surface height change measurements at the time interval of the meteorological forcing data at the location of the AWS
- Stake measurements of surface height change at the AWS spanning the ablation season, and ideally at some time points within it
- dGPS measurements of surface height change at the AWS spanning the ablation season, and ideally at some time points within it
- high resolution dDSM measurements of surface height change at the AWS spanning the ablation season, and ideally at some time points within it
- independent measurements of surface temperature at the AWS location at any available point during the meteorological forcing data
- temperature measurements at known depths within the debris cover at the AWS location at any available point during the meteorological forcing data