Working group meeting of WG3, March, 9, 2017, Offenbach, Germany

Workshop Meeting Notes

Summary

Data assimilation methods and use of snow observations

- Using satellite data products (e.g., IMS) to force land-surface models with NASA LIS (integrated modeling and DA framework)
- Improve snow depth reports availability on the GTS using WMO GCW and COST Harmosnow ressources
- Combined assimilation of both types of observations, in situ snow depth and IMS snow cover, significantly improves near surface weather parameter forecasts
- Assimilation of snow information can improve spring melt forecasts in hydrological models (manual observations of snow water equivalent and satellite based data on fractional snow cover area are mainly useful)
- Mountainous area are problematic: sparse manual snow observations combined with uncertainties in satellite data
- SNOWE technology at SYNOP stations considers history of snow pack for initialisation of COSMO forecasts

Snow observations and evaluation

- Monitoring of snow reporting practices - allows trace back of potential model forcast quality changes. Permanent task and with long-term record valuable for reanalysis and climatological investigations
- Satellite based snow extent as categorical variable (yes/no), observational error of snow extent, how to combine snow extent from different satellites
- Using spectral fingerprint of snow to detect snow from space, Channels for NDVI are suitable for detection of snow, combination of satellite products (IMS, LSA-SAF)
- Using long-term records of satellite data - retrieve snow information (CryoClim, IMS, Heliosat/HelSnow)
- Combination of ground-based remote sensing by ceilometer with space-born CALIPSO and satellite imagery for blowing snow events

Discussion:

- Several presentations addressed methods for combining in situ and satellite data.
- Future of snow DA: on the long term to use radiances.

Snow observations and models

- Forcing high-res snow models with additional satellite data - sensitivity on snow extent thresholds
- Long analysis phase (past 30h) for Snow4 model, combination with remote sensing data to estimate the spatial structure of the snow cover in regions with sparse or no surface observations

Discussion:

- Problems in snow analysis related to DA: wrong water budget if correction for snow melting issues in the model is applied
- Combined snow and soil moisture DA is useful to keep consistency in the water budget. At FMI they use negative snow increments to increase the snow melting instead of just removing snow.
- Observation errors: Relationship between MODIS snow product errors and temperature (J. Dong et al.,2014,http://dx.doi.org/10.1175/JHM-D-13-060.1)

Snow observations and hydrological models

- Main factors influencing SWE in forest are vegetation type and state, altitude, exposition for example
- Consideration of vegetation effects on snow could improve forecast of water supply in catchment areas with forests
- Research station data Svalbard: long-term measurements, HBV hydrological simulations, sensitvity of data time step and data averaging on model results
- Investigating the seasonality of snow in western Spitsbergen (4 stations) - analysis of potential sources of change in snow depth

Final Discussion:

- Contributions covered different scales in space and time
- Common methods and objectives/challenges exist to combine in situ and satellite data
- Overall a very instructive workshop for all participants
- Good variety of presentation - Discussion of processes and data assimilation methods.
- Would be useful to have more combined products retrieval approaches.
- Useful also for persons starting to be interested in DA.
- Flow dependent approaches are also useful.
- The format of the workshop is very good with 30 min time slots so that in depth presentations were given.
- It would be useful to have continuity of this collaboration beyond the COST action.

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WG3 Meeting Notes

Discussion items

Task 3.1 overview of various snow observations and data assimilation methods used in NWP, hydrology, and climate studies.

- An overview publication on snow observations used for diversity of application would be useful – as seen in this workshop.
- We should see what was done in SnowMIP2 who already did similar comparison. It would be more relevant to do the overview from the satellite requirement point of view than from the model point of view.
- Difficulty to link snow depth to snow cover and snow water equivalent. The information that we can add here compared to what was done before, is how do we extract the equivalent information to link it to the observation.

Task 3.2 Finding methods to combine satellite observations to in situ data.

- In this workshop we addressed how to use snow cover from different sources.

Task 3.3 Strategies toward more extended usage of conventional snow observations

- Within this COST action several partners have developed a snow observation smonitoring system (DWD, ECMWF, SMHI).
- They provide complementary monitoring tools, some are at the station location or gridded ; interactive (SMHI and DWD).
- DWD and SMHI will see if there is a possibility to make it available for this group.
- The ECMWF monitoring is publicly available.
- Within the Imprex project there are resources to compare snow analysis products.

Task 3.4 Observation errors

- Several contributions of the workshop addressed the problem of the spatial and temporal representativeness errors of snow measurements for data assimilation in NWP and hydrological models