

Design of an optimal snow observation network to estimate snowpack

Antonio Juan Collados Lara (2), Eulogio Pardo-Iguzquiza (1), and David Pulido-Velazquez (2)

(1) Instituto Geológico y Minero de España, Ríos Rosas, 23, 28003 Madrid (Spain), (2) Instituto Geológico y Minero de España, Urb. Alcázar del Genil, 4. Edificio Zulema Bajo, 18006, Granada (Spain)

Snow is an important water resource in many river basins that must be taken into account in hydrological modeling. Although the snow cover area may be nowadays estimated from satellite data, the snow pack thickness must be estimated from experimental data by using some interpolation procedure or hydrological models that approximates snow accumulation and fusion processes. The experimental data consist of hand probes and snow samples collected in a given number of locations that constitute the monitoring network. Assuming that there is an existing monitoring network, its optimization may imply the selection of an optimal network as a subset of the existing network (decrease of the existing network in the case that there are no funds for maintaining the full existing network) or to increase the existing network by one or more stations (optimal augmentation problem). In this work we propose a multicriterion approach for the optimal design of a snow network. These criteria include the estimation variance from a regression kriging approach for estimating thickness of the snowpack (using ground and satellite data), to minimize the total snow volume and accessibility criteria. We have also proposed a procedure to analyze the sensitivity of the results to the non-snow data deduced from the satellite information. We intent to minimize the uncertainties in snowpack estimation. The methodology has been applied to estimation of the snow cover area and the design of the optimal snow observation network in Sierra Nevada mountain range in the Southern of Spain.

Acknowledgments: This research has been partially supported by the GESINHIMPADAPT project (CGL2013-48424-C2-2-R) with Spanish MINECO funds. We would also like to thank ERHIN program and NASA DAAC for the data provided for this study.