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Supplement of

Snow water equivalent in the Alps as seen by gridded data sets, CMIP5 and CORDEX climate models

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ERA-Interim/Land precipitation and snow water equivalent compared to ERA-Interim

ERA-Interim/Land and ERA-Interim snow water equivalent (SNW) climatologies are derived using the ECMWF land surface model HTESSEL, being ERA-Interim/Land the result of *offline* simulation driven by meteorological forcing from the ERA-Interim atmospheric reanalysis and precipitation adjustments based on GPCP v2.1.

- 5 Percent differences of DJFMA precipitation forcing in ERA-Interim/Land with respect to ERA-Interim in the Alpine region are reported in Fig. S1a. ERA-Interim/Land presents a larger precipitation amount over the Alpine range, partially compensating the original ERA-Interim dry bias. The additional precipitation input is reflected in a thicker snowpack, locally exceeding ERA-Interim values by more than 100 kg/m^2 .

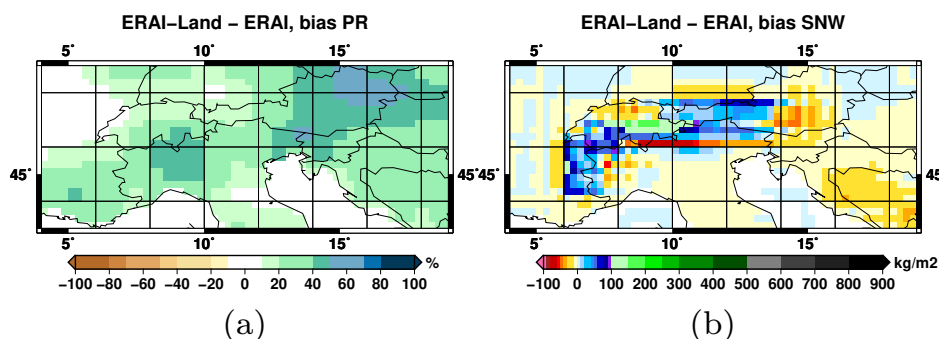


Figure S1. a) Percent difference in the multiannual mean (1980-2005) of the DJFMA accumulated precipitation in ERA-Interim/Land with respect to ERA-Interim; (b) Bias of ERA-Interim/Land DJFMA average snow water equivalent climatology (1980-2005) with respect to ERA-Interim.

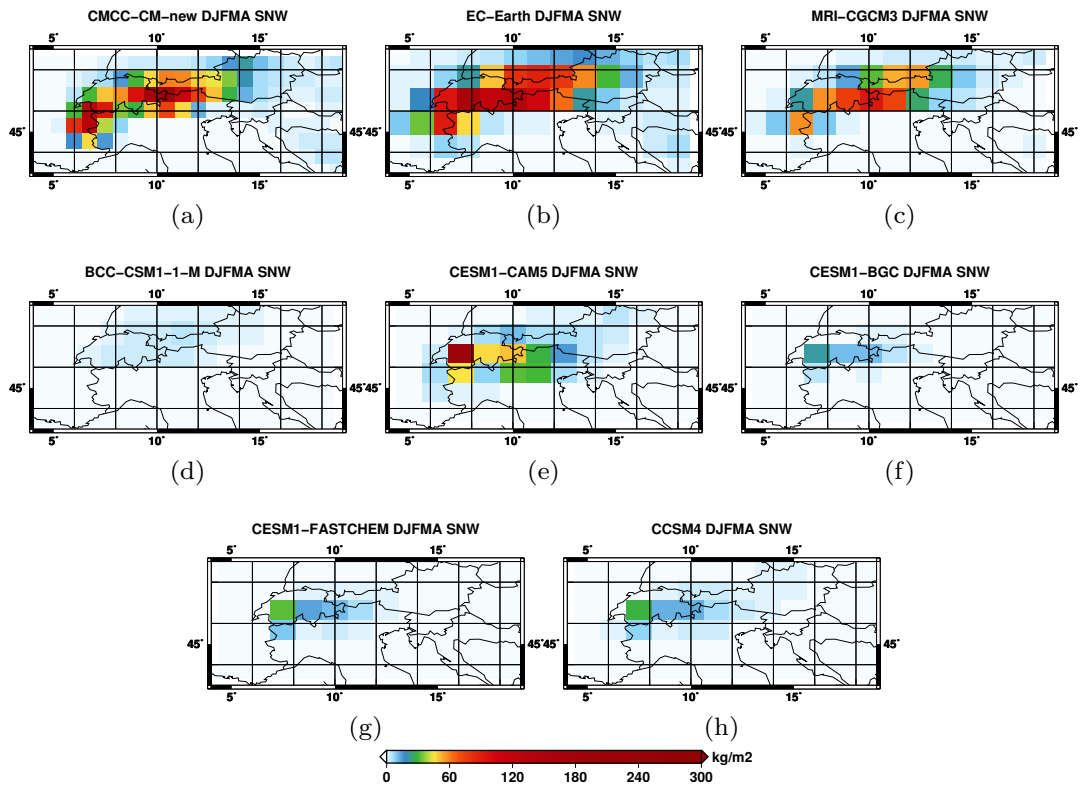


Figure S2. Multiannual mean (1980-2005) of the DJFMA SNW for GCMs with spatial resolution equal or finer than 1.25°lon. Out of the 4 CESM-family models (e-h), three (f-h) present very similar SNW patterns.

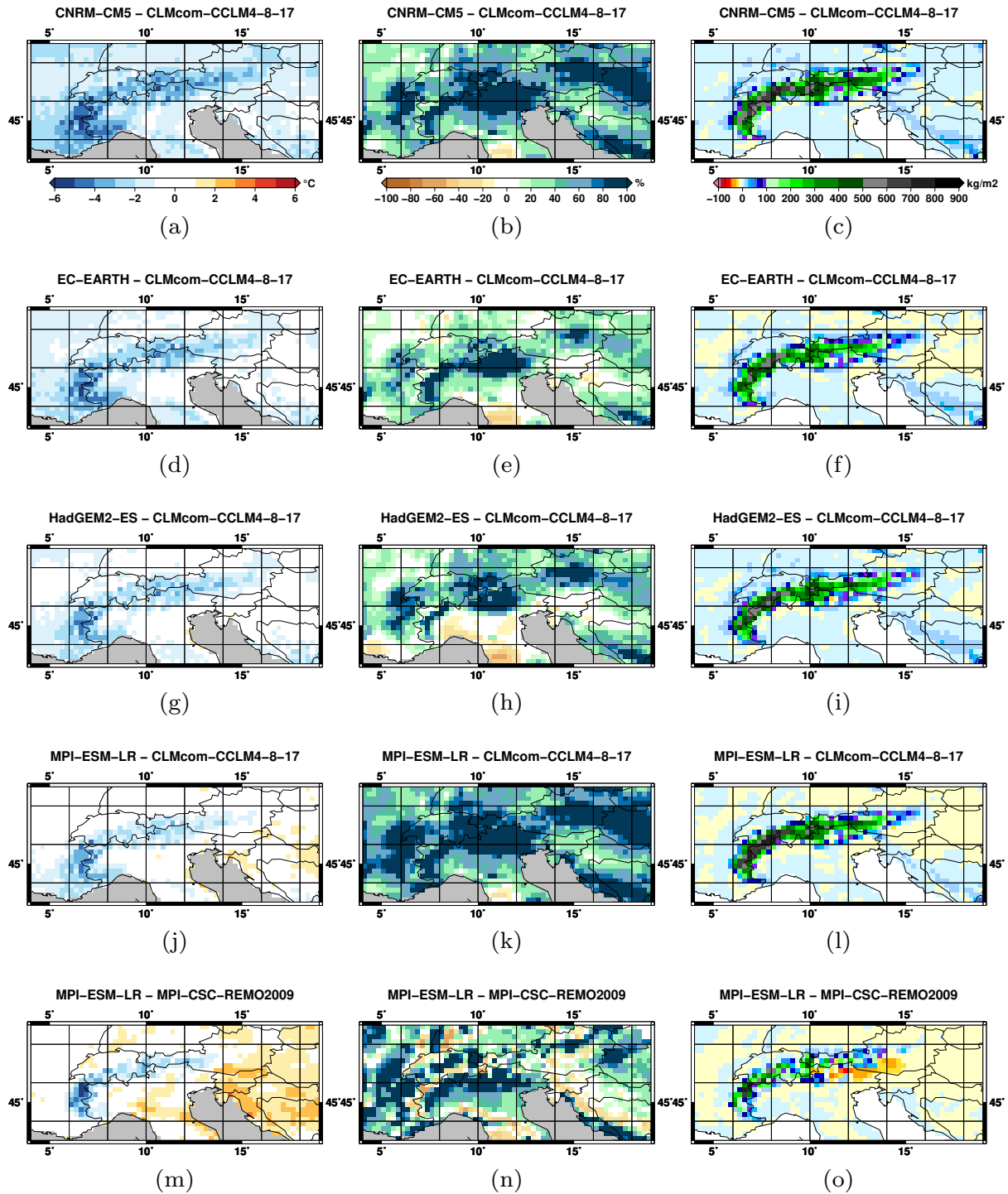


Figure S3. Biases of the GCM-driven CCLM4 and REMO2009 DJFMA surface air temperature, precipitation and snow water equivalent climatologies with respect to the reference datasets EOBS and NSIDC Global SNW, over the period 1980-2005.

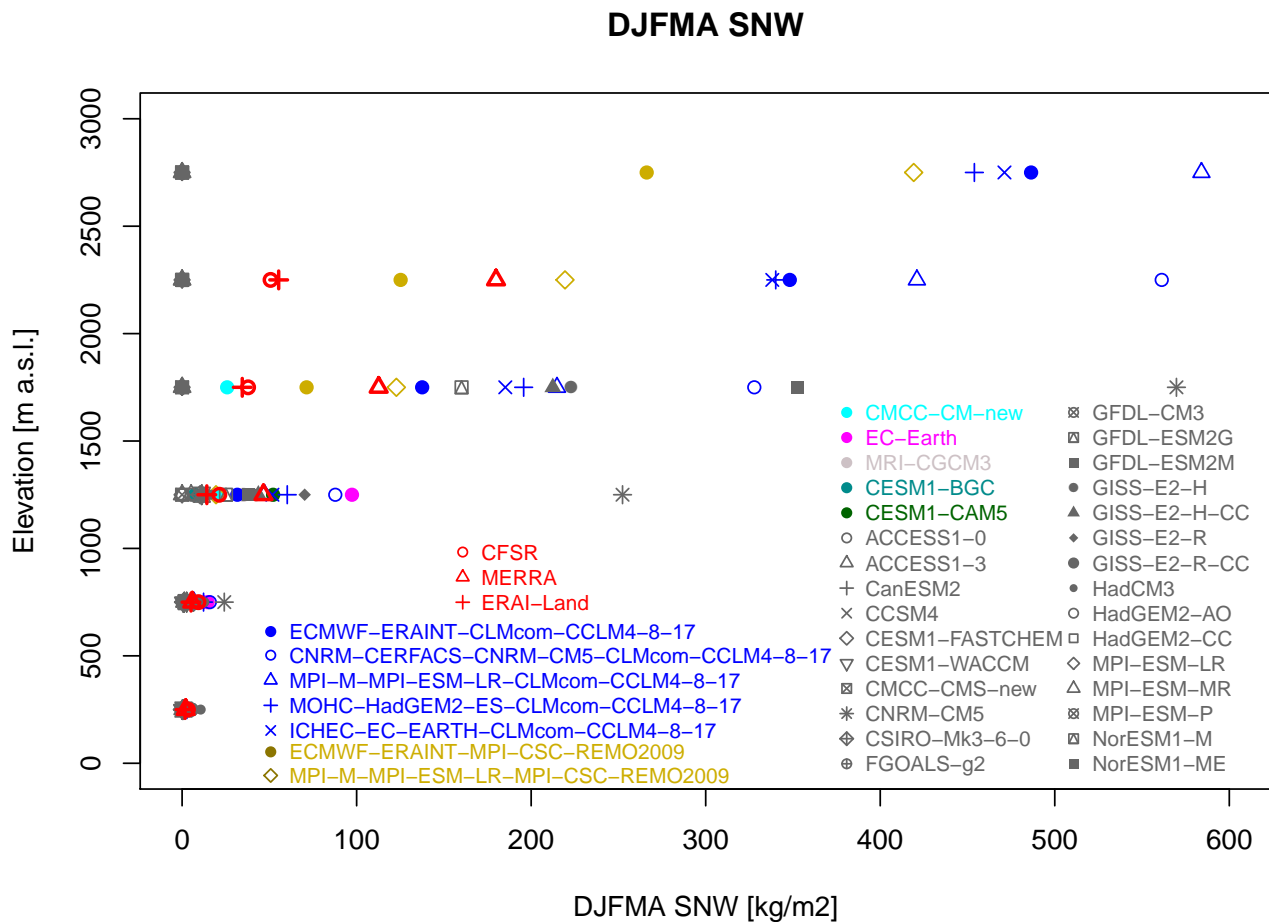


Figure S4. DJFMA snow water equivalent climatologies derived from reanalyses, EURO-CORDEX ERA-Interim-driven and GCM-driven RCMs, and CMIP5 GCMs, have been spatially averaged over different elevation ranges 500 meters wide. The elevation is derived from the topography of each reanalysis/climate model.