Supplementary Materials: Merging Alternate Remotely Sensed Soil Moisture Retrievals Using a Non-Static Model Combination Approach

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This supplemental material supports the main manuscript with Figures (Figures S1–S4), example codes for combining two soil moisture products and global datasets including statically/dynamically combined soil moisture and static/time-varying weights over the 2-year study period.
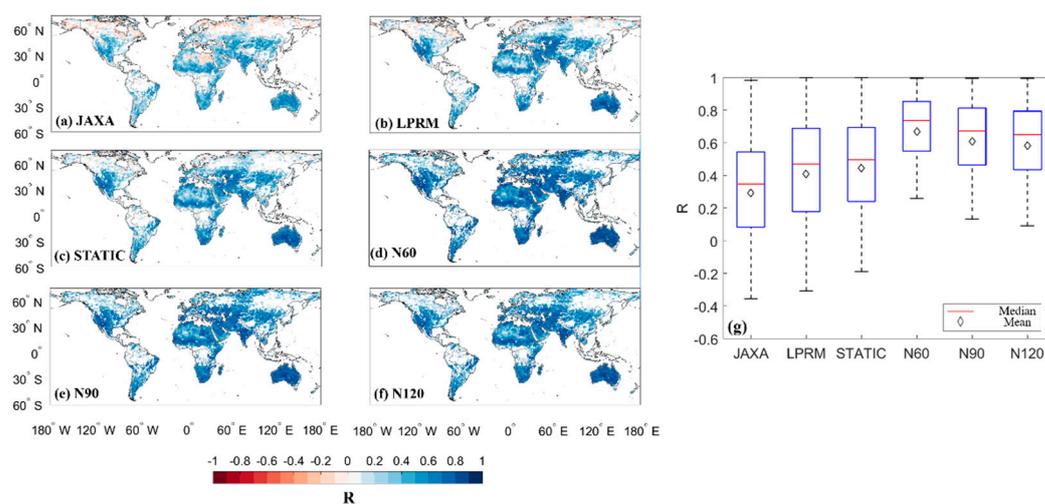
Figures

Figure S1. Results from experiments that uses MERRA-Land as the reference for various window sizes (N60, N90 and N120). Each panel shows the R between the reference and (**a**) JAXA; (**b**) LPRM; (**c**) static; (**d**) N60; (**e**) N90 and (**f**) N120. The more bluish colors in the maps indicate higher R against the reference, the overall performance for the various scenarios is summarized in a boxplot (**g**).
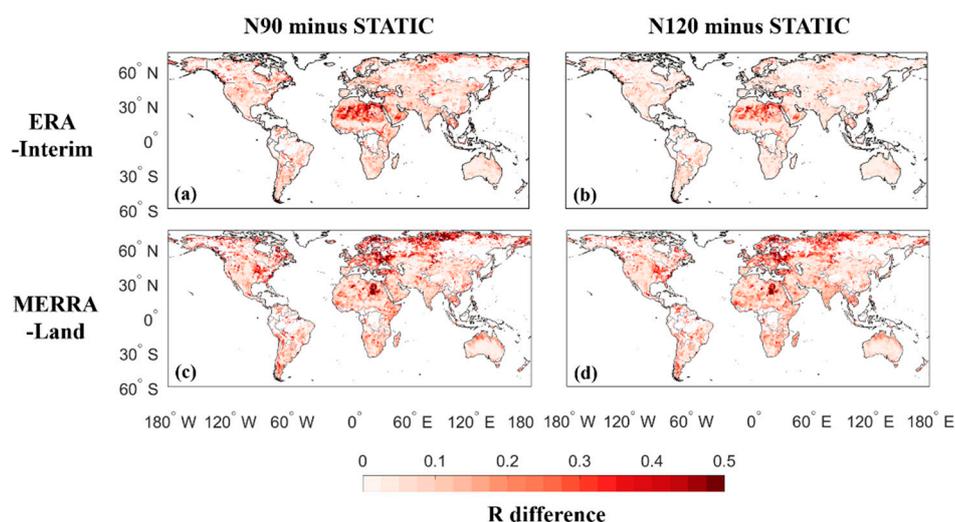

Figure S2. Differences in R between the static and dynamic products (N90 and N120). For ERA-Interim as the reference, (**a**) R of N90 minus R of static and (**b**) R of N120 minus R of static; (**c**) and (**d**) show corresponding results with (**a**) and (**b**) when using MERRA-Land as the reference. With relation to Figure 4a in the main manuscript, it is shown that the differences are more contrasted with shorter N sizes.
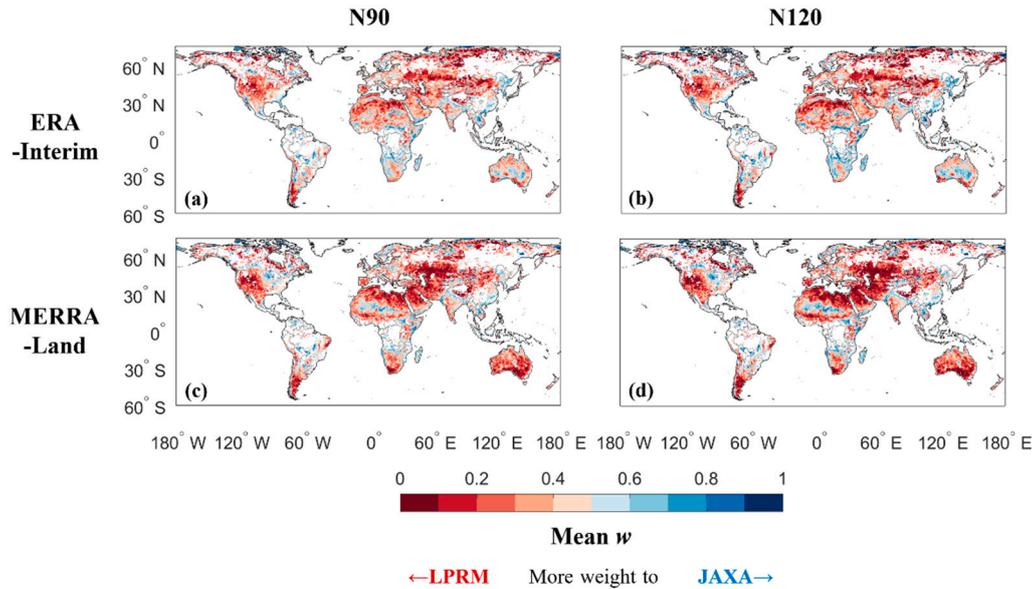
Figure S3. Mean weights used for dynamically combined soil moisture products. For ERA-Interim as the reference, (**a**) presents mean weights from N90 over the 2-year study period; and (**b**) from N120; (**c**) and (**d**) show corresponding results with (**a**) and (**b**) when using MERRA-Land as the reference.
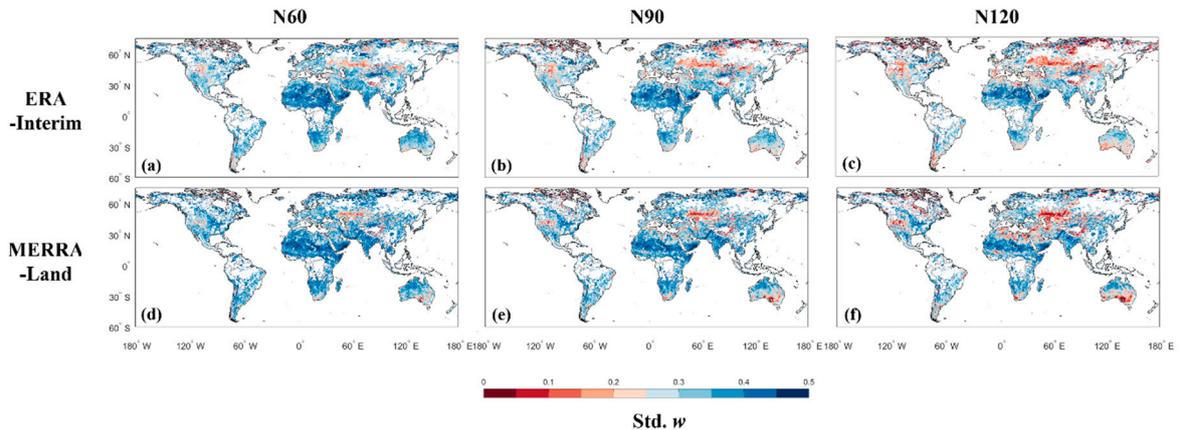

Figure S4. Standard deviations of optimal weights used for dynamically combined soil moisture products. For ERA-Interim as the reference, (**a**) presents standard deviations from N60 over the 2-year study period; (**b**) from N90; and (**c**) N120. (**d**), (**e**) and (**f**) show corresponding results with (**a**), (**b**) and (**c**) when using MERRA-Land as the reference.

Codes

It is available at "http://www.hydrology.unsw.edu.au/download/software/dynamic-linear-combination" example codes written in m files for static and dynamic linear combinations at LasBrozas station in the Soil Moisture Measurement Stations Network of the University of Salamanca (REMEDHUS).

▪ Data files

(1) "dateList.mat": list of date formatted in "yyyymmdd"
(2) "insitu.mat": date number and *in-situ* soil moisture at REMEDHUS_LasBrozas station
(3) "parent1.mat": parent soil moisture 1 (*i.e.*, JAXA)
(4) "parent2.mat": parent soil moisture 2 (*i.e.*, LPRM)
(5) "reference.mat": reference soil moisture (*i.e.*, MERRA-Land)

(6) "SM_dynamic.mat": dynamically combined soil moisture
(7) "SM_static.mat": statically combined soil moisture
(8) "w_dynamic.mat": dynamic weights
(9) "w_static.mat": static weights

▪ Codes

(1) "static_combination.m": code for static linear combination
(2) "dynamic_combination.m": code for dynamic linear combination
(3) "plotting_results.m": code for plotting combination results
(4) "opt_w.m": function for calculation optimal weights by optimization
(5) "opt_w_eq.m": function for calculation optimal weights by Equation (3) in the main manuscript

▪ Others

(1) "REMEDHUS_LasBrozas.tif/fig": plots showing static/dynamic combination results at REMEDHUS_LasBrozas station

Datasets

It is available at "http://www.hydrology.unsw.edu.au/download/software/dynamic-linear-combination" global datasets from static and dynamic (N60) linear combinations over the 2-year study period using ERA-Interim and MERRA-Land soil moisture as references.

▪ Study period: 1 January 2013 to 31 December 2014
▪ Included data: statically/dynamically combined soil moisture and weights using ERA-Interim and MERRA-Land as reference