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Monthly new water fractions and their relationships with climate and catchment properties across Alpine rivers

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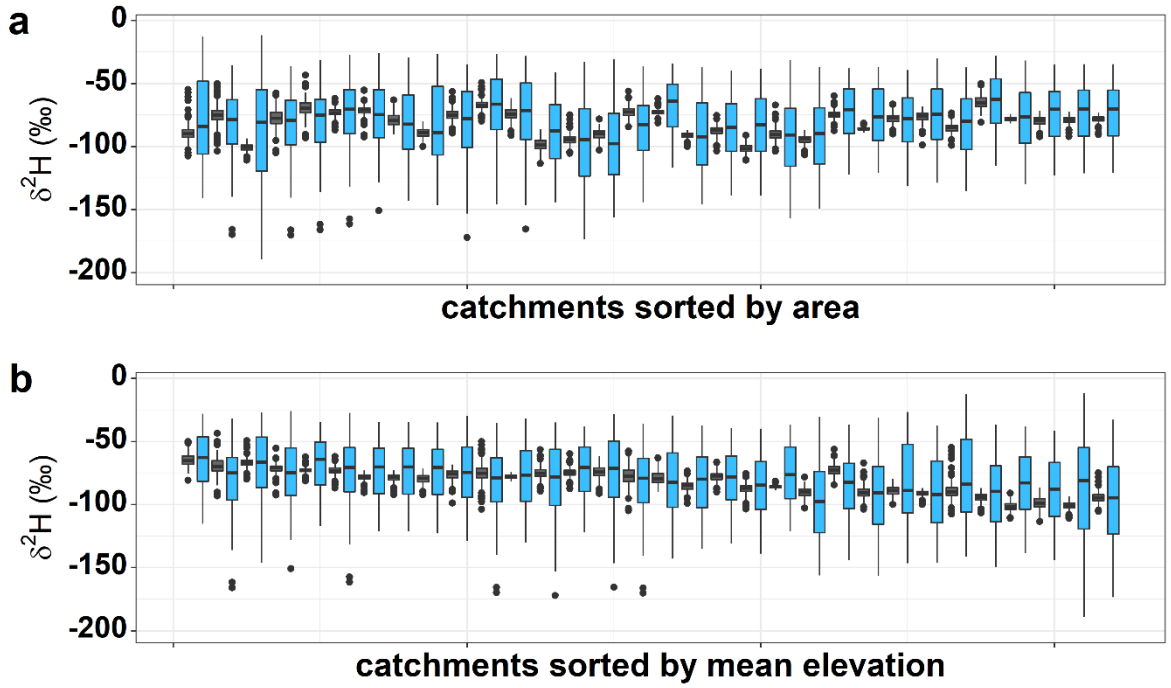

Figure S1: Boxplots of the δ^2H isotopic composition of precipitation (light blue) and streamflow (dark grey) across all 32 Alpine catchments sorted by catchment area (a) and mean catchment elevation (b).

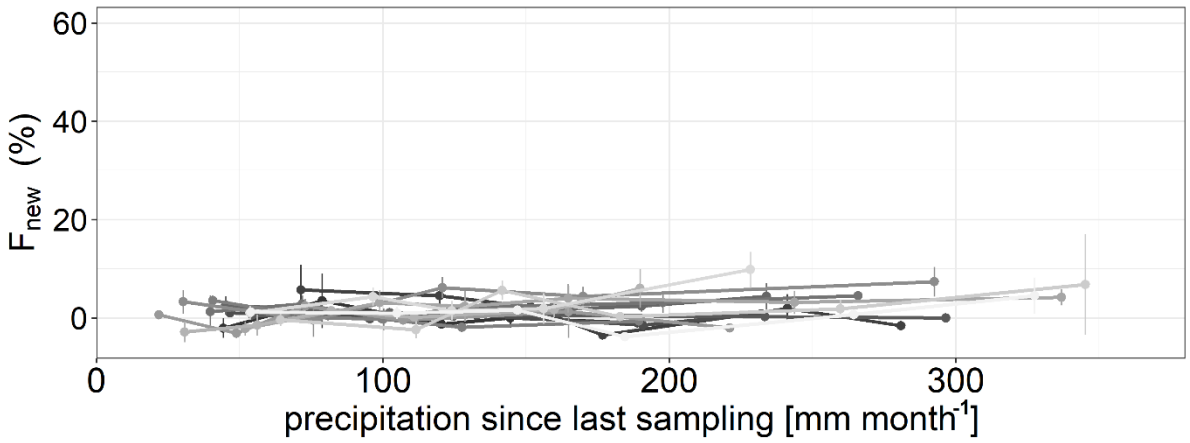

Figure S2: The volume-weighted fraction of new water (F_{new}) as a function of monthly precipitation totals during the month immediately preceding the sampling date. For 14 out of 32 catchments, F_{new} remains below 10% even at the highest monthly precipitation totals.

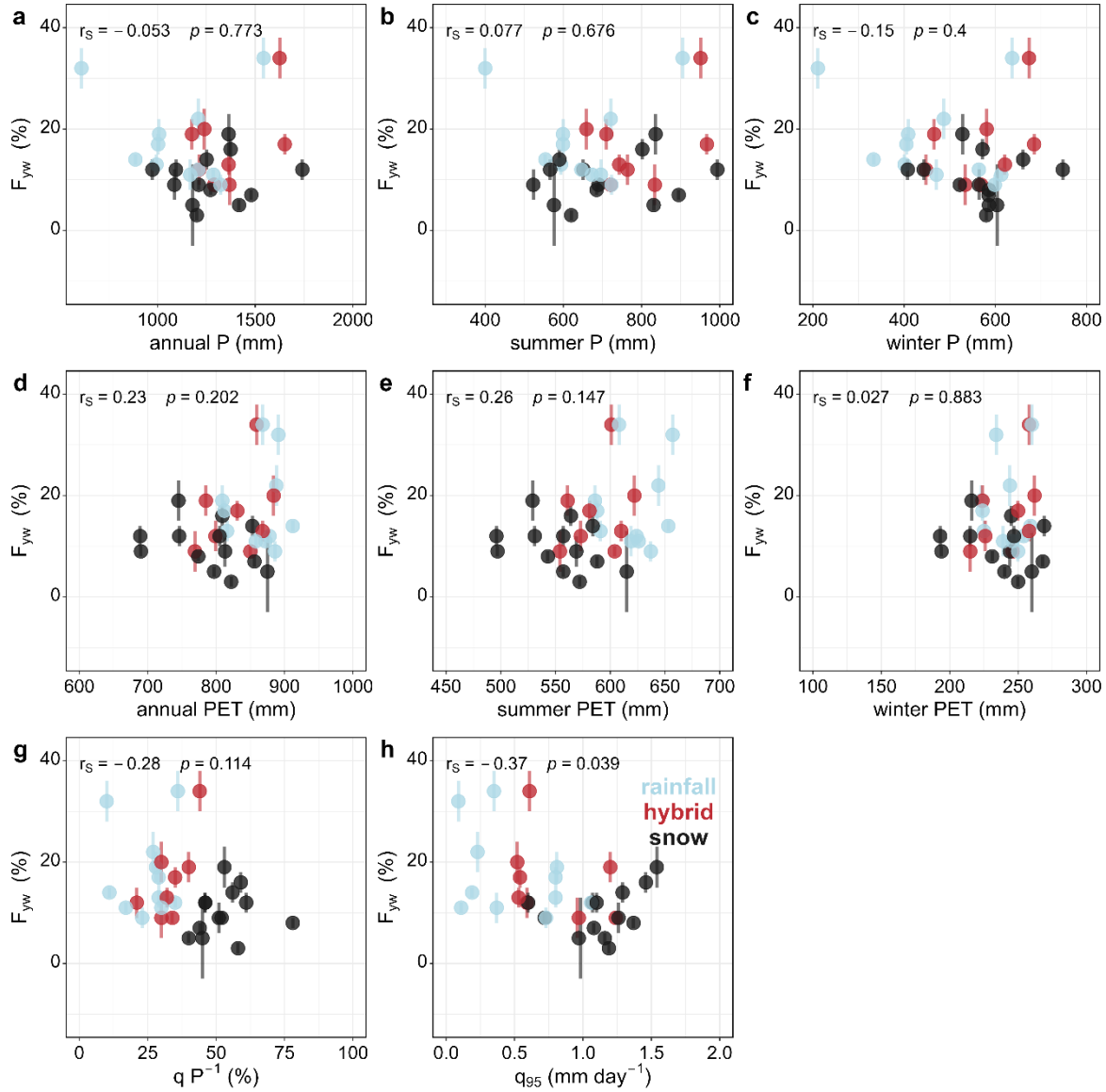

Figure S3: Relation of volume-weighted young water fractions (F_{yw}) and (a) annual precipitation, (b) summer (May through October) precipitation, (c) winter (November through April) precipitation, (d) annual potential evapotranspiration, (e) summer (May through October) potential evapotranspiration, (f) winter (November through April) potential evapotranspiration, (g) the fraction of annual discharge in relation to annual precipitation ($q\ P^{-1}$), and (h) and q_{95}, the discharge reached or exceeded 95% of the year. The colours indicate the different precipitation regimes (light blue for rainfall, red for hybrid and black for snow dominated). While F_{yw} are not strongly related to precipitation, F_{yw} are related to *PET* and the hydrological variables.

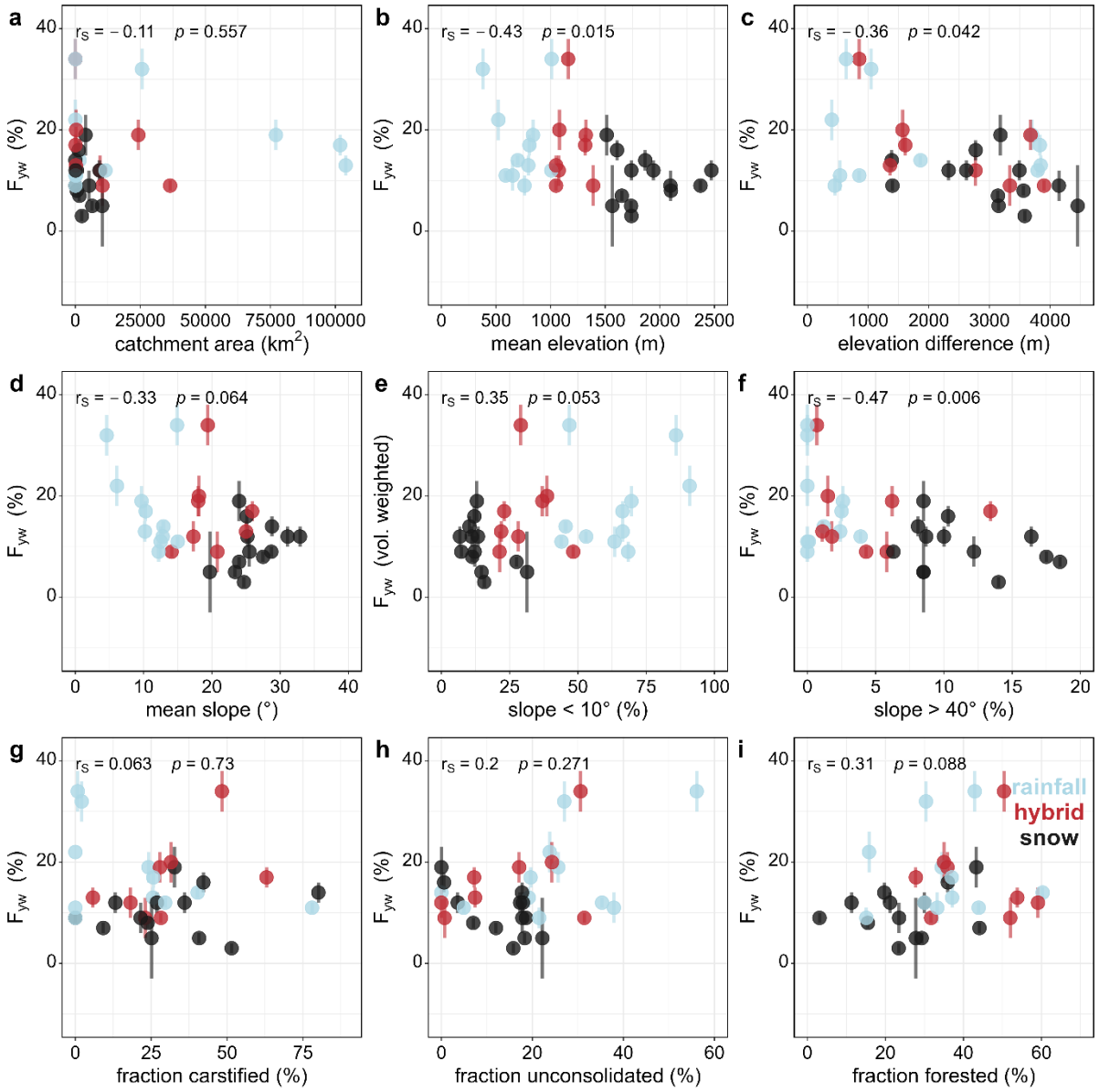

Figure S4: Relation of volume weighted young water fractions (F_{yw}) and (a) catchment area, (b) elevation difference, (c) elevation difference divided by area, (d) mean slope, (e) fraction of slope smaller 10°, (f) fraction of slope stepper 40°, (g) fraction of the catchment consisting of carstified rocks, (h) fraction of the catchment covered by unconsolidated rocks, and (i) fraction of catchment covered by forests. The colours indicate the different precipitation regimes (light blue for rainfall, red for hybrid and black for snow dominated). F_{yw} are strongly related to elevation difference and fraction of slope larger 40°.

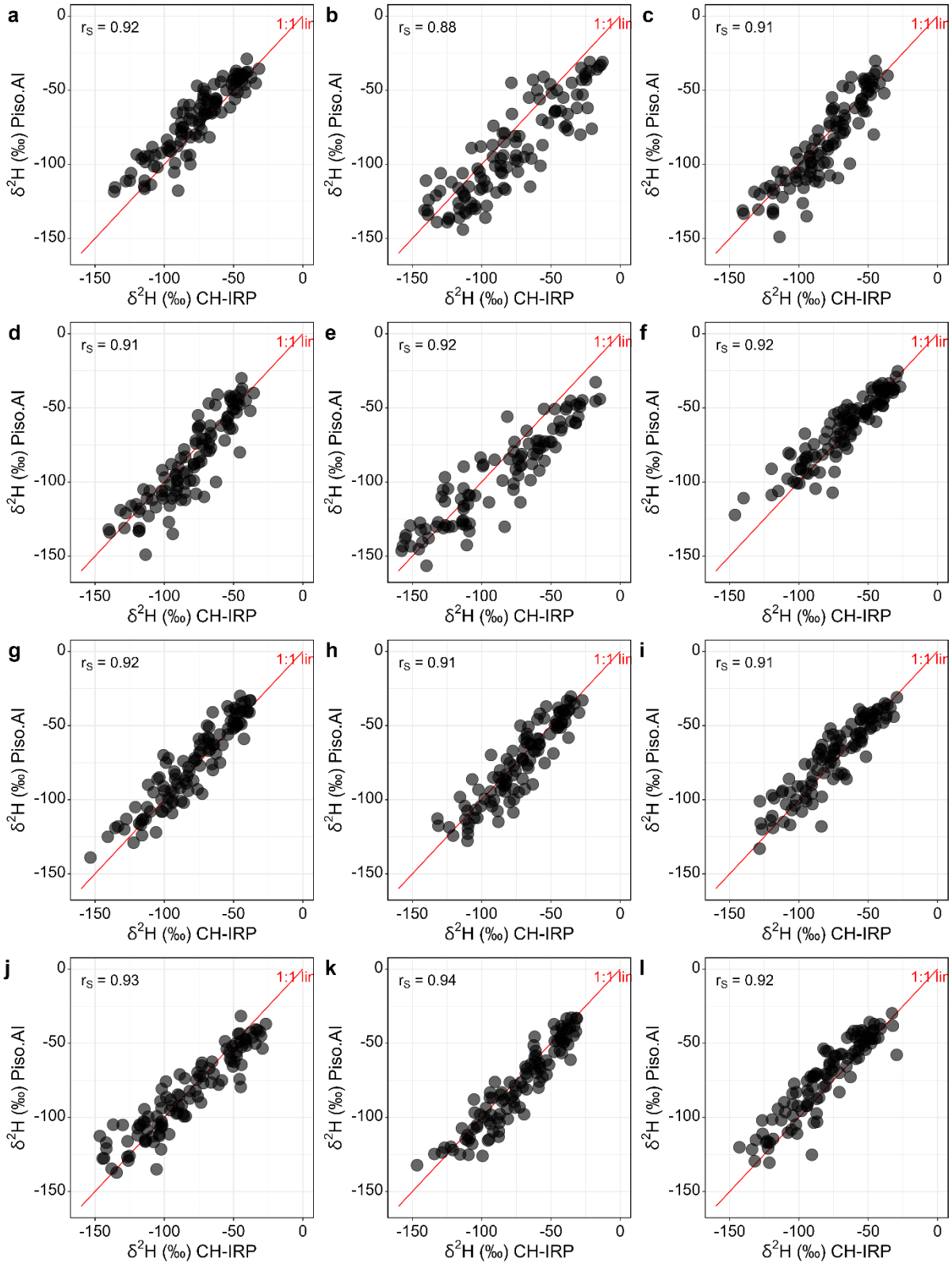

Figure S5: Comparison of precipitation δ^2H isotope data provided in the CH-IRP dataset and extracted from the Piso.AI database (Nelson *et al.*, 2021) for the 12 Swiss CH-IRP sites.

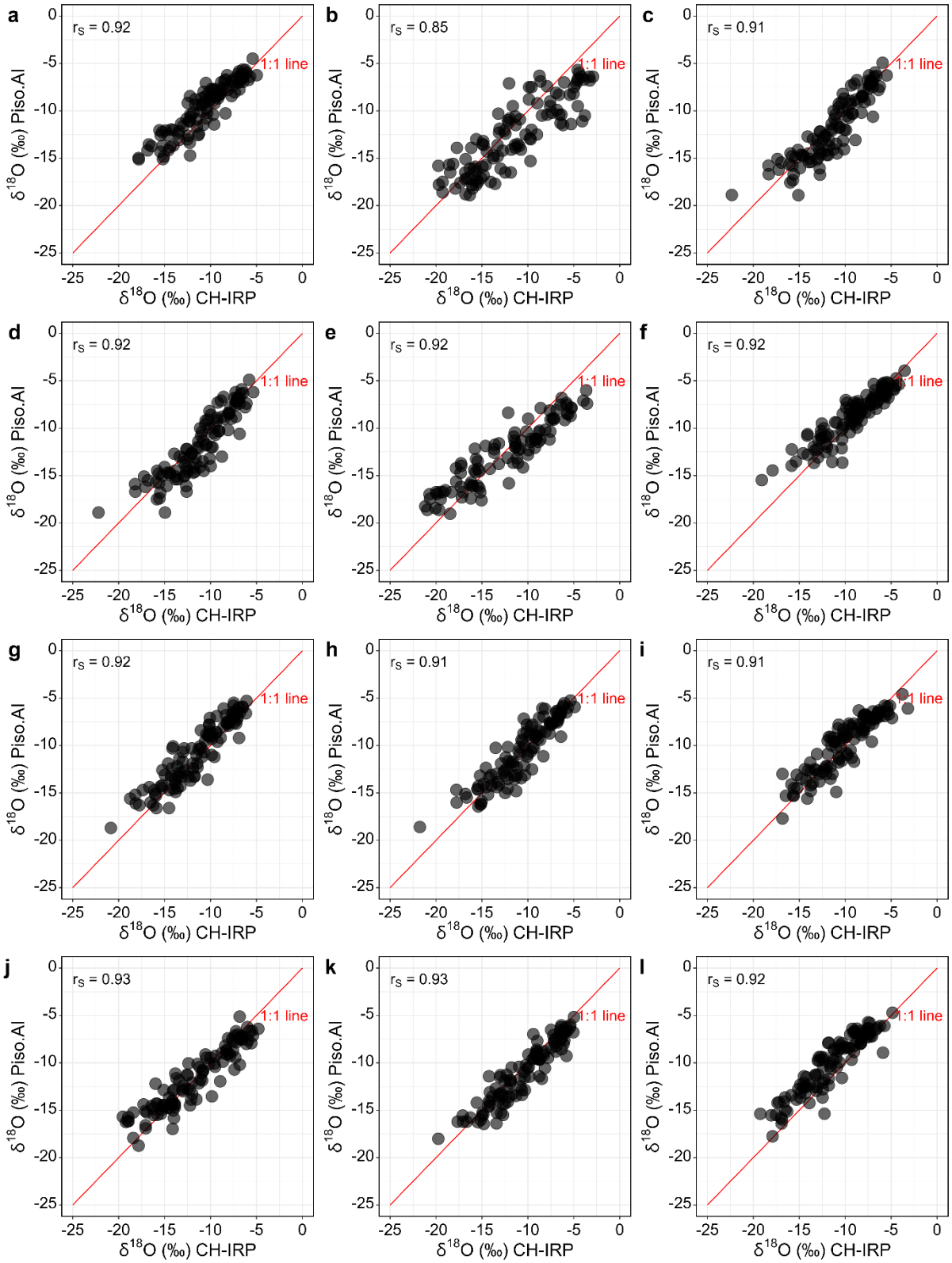

Figure S6: Comparison of precipitation $\delta^{18}O$ isotope data provided in the CH-IRP dataset and extracted from the Piso.AI database (Nelson *et al.*, 2021) for the 12 Swiss CH-IRP sites.