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Supplement of

What controls the stable isotope composition of precipitation in the Mekong Delta? A model-based statistical approach

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Supplement for "What controls the stable isotope composition of precipitation in the Mekong Delta? A model-based statistical approach"

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S1: Sensitivity of LMWL to regression techniques

The sensitivity of the LMWL to different regression techniques was tested applying three methods of linear regression between $\delta^{18}O$ and $\delta^{2}H$ values:

1) ordinary least squares regression (OLSR),

2) reduced major axis (RMA) regression,

3) precipitation amount weighted least squares regression (PWLSR).

OLSR and RMA give equal weight to all data points regardless of their precipitation amount, while PWLSR minimizes the effect of smaller precipitation amounts (Hughes and Crawford, 2012), which are more likely to have a lower d-excess due to re-evaporation of raindrops below the cloud base (Jacob and Sonntag, 1991), or biases in the sampling method (Froehlich, 2001). OLSR tends to be more useful when investigating the interaction between hydro-climatic processes and stable isotope signatures in precipitation, whereas PWLSR is adequate in studying surface and groundwater hydrology (Hughes and Crawford, 2012). For a more detailed discussion, the reader is referred to IAEA (1992); Hughes and Crawford (2012); Crawford et al. (2014).

The quality of fit of the three LMWLs resulting from OLSR, RMA, and PWLSR was evaluated based on the coefficient of determination R^2, also referred to as explained variance, the standard error SE and the statistical significance value (p-value). The regression model indicates a good fit to the data when R^2 is close to 1.0, the standard error is small in relation to the magnitude of the data, and the p-value is smaller than 0.0001 (Helsel and Hirsch, 2002).

The resulting regressions are:

1) Ordinary least squares regression (OLSR):

$\delta^{2}H = (7.56 \pm 0.11) * \delta^{18}O + (7.26 \pm 0.67)$

($SE = 2.26$; $r^2 = 0.99$; $p < 0.0001$; $n = 74$),

2) Reduced major axis regression (RMA):

$\delta^2H = (7.61 \pm 0.11) * \delta^{18}O + (7.58 \pm 0.68)$

($SE = 2.27$; $r^2 = 0.99$; $p < 0.0001$; $n = 74$),

3) Precipitation amount weighted least squares regression (PWLSR):

$\delta^2H = (7.61 \pm 0.11) * \delta^{18}O + (7.87 \pm 0.73)$

($SE = 2.29$; $r^2 = 0.99$; $p < 0.0001$; $n = 74$).

S2: MLR analysis of δ^2H

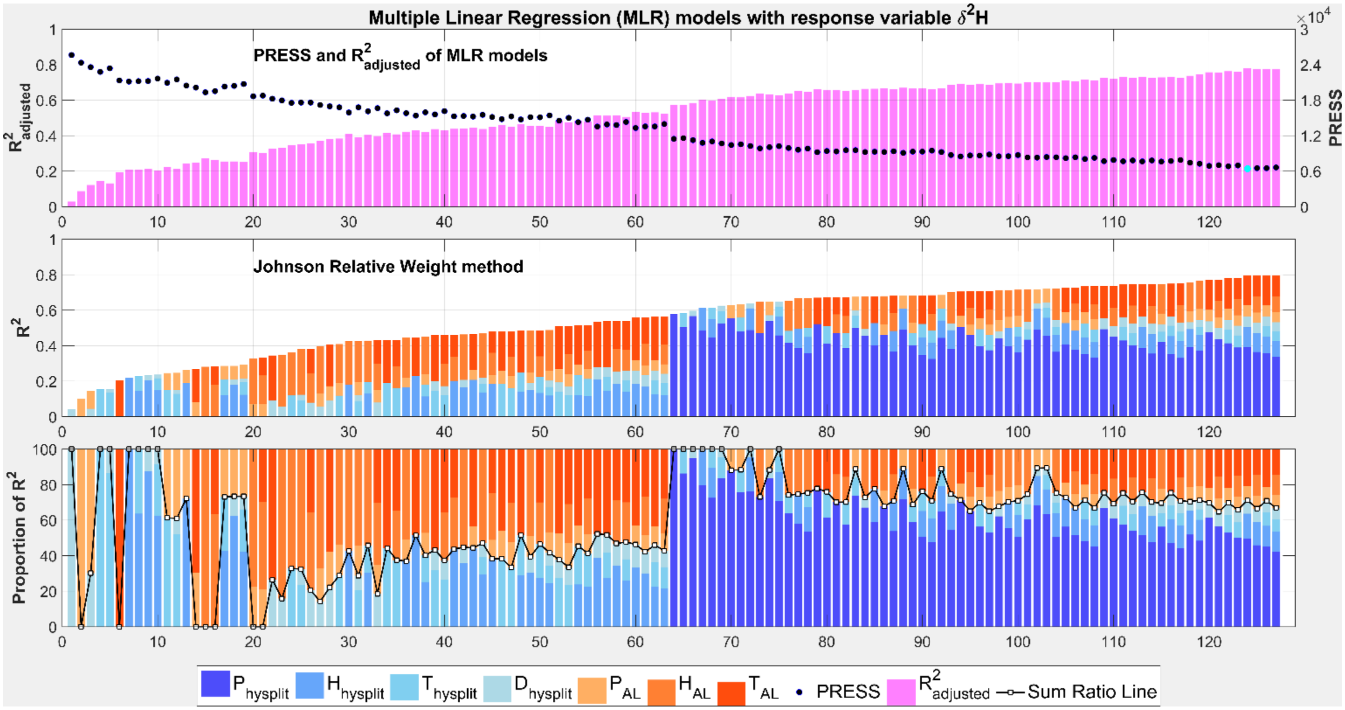

Figure S1: MLR with response variable δ^2H and relative importance analysis applied for all possible subsets. The 127 MLR models are sorted according to their R^2 values in ascendant order. Colors represent the relative contribution (in %) of the predictors. The sum ratio line separates the role of local (in red and orange) and regional (in blue) factors. PRESS and adjusted R^2 values indicate the quality of the MLR model. The best MLR model depicted by the lowest PRESS (model 124, highlighted by the cyan dot) explains 79% of the δ^2H variation ($R^2 = 0.79$).

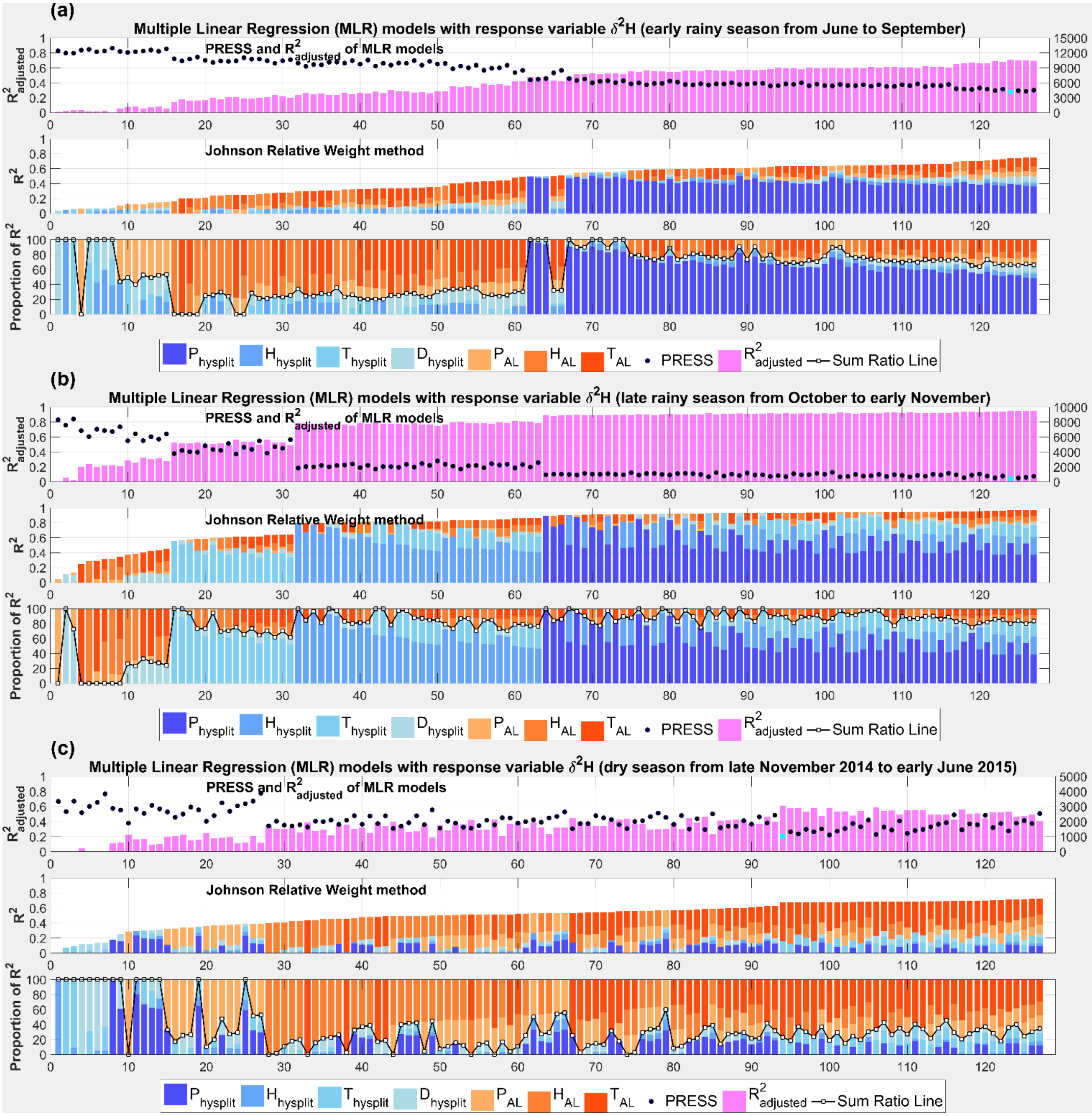

Figure S2: MLR with response variable δ^2H and relative importance analysis applied for all possible subsets (127 MLR models) for different seasons: a) early monsoon from June to September, b) late monsoon from October to mid-November, and c) the dry season from mid-November to mid-June.

S3: MLR analysis of d-excess

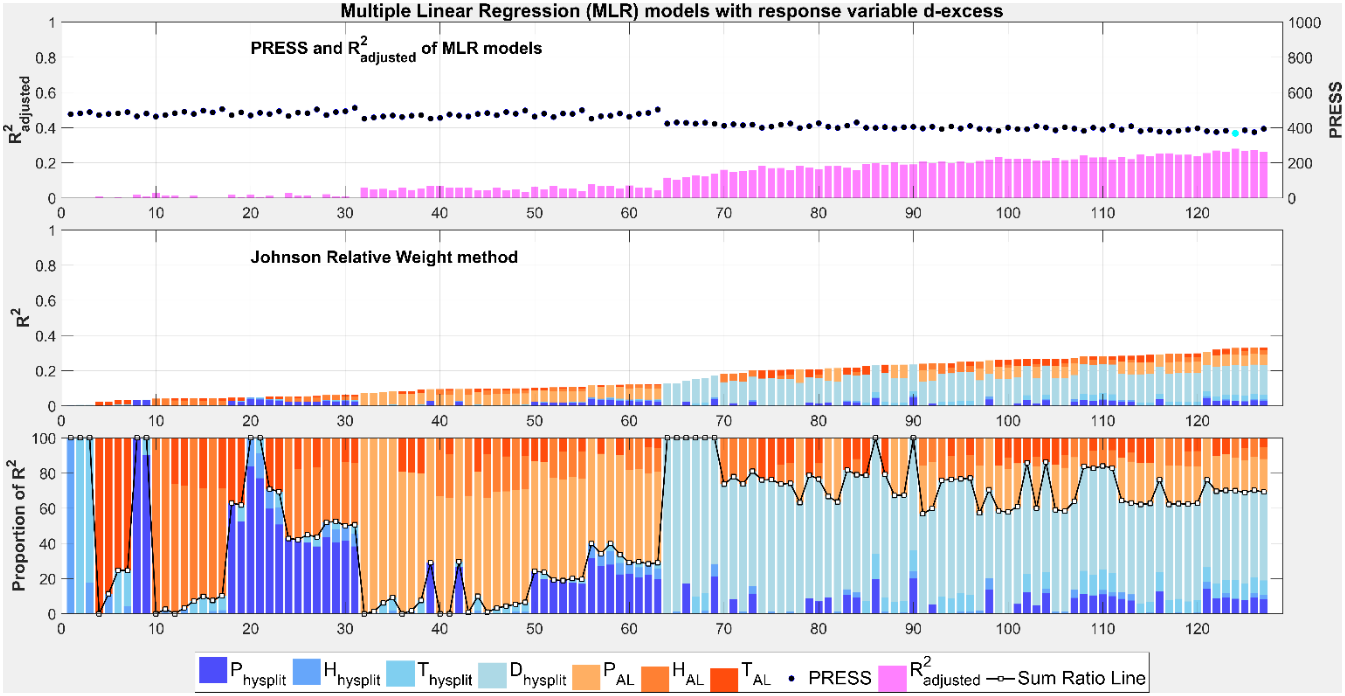

Figure S3: MLR with response variable d-excess and relative importance analysis applied for all possible subsets. The 127 MLR models are sorted according to their R^2 values in ascendant order. Colors represent the relative contribution (in %) of the predictors. The sum ratio line separates the role of local (in red and orange) and regional (in blue) factors. PRESS and adjusted R^2 values indicate the quality of the MLR model. The best MLR model depicted by the lowest PRESS (model 124, highlighted by the cyan dot) explains 30% of the d-excess variation (R^2 = 0.3).

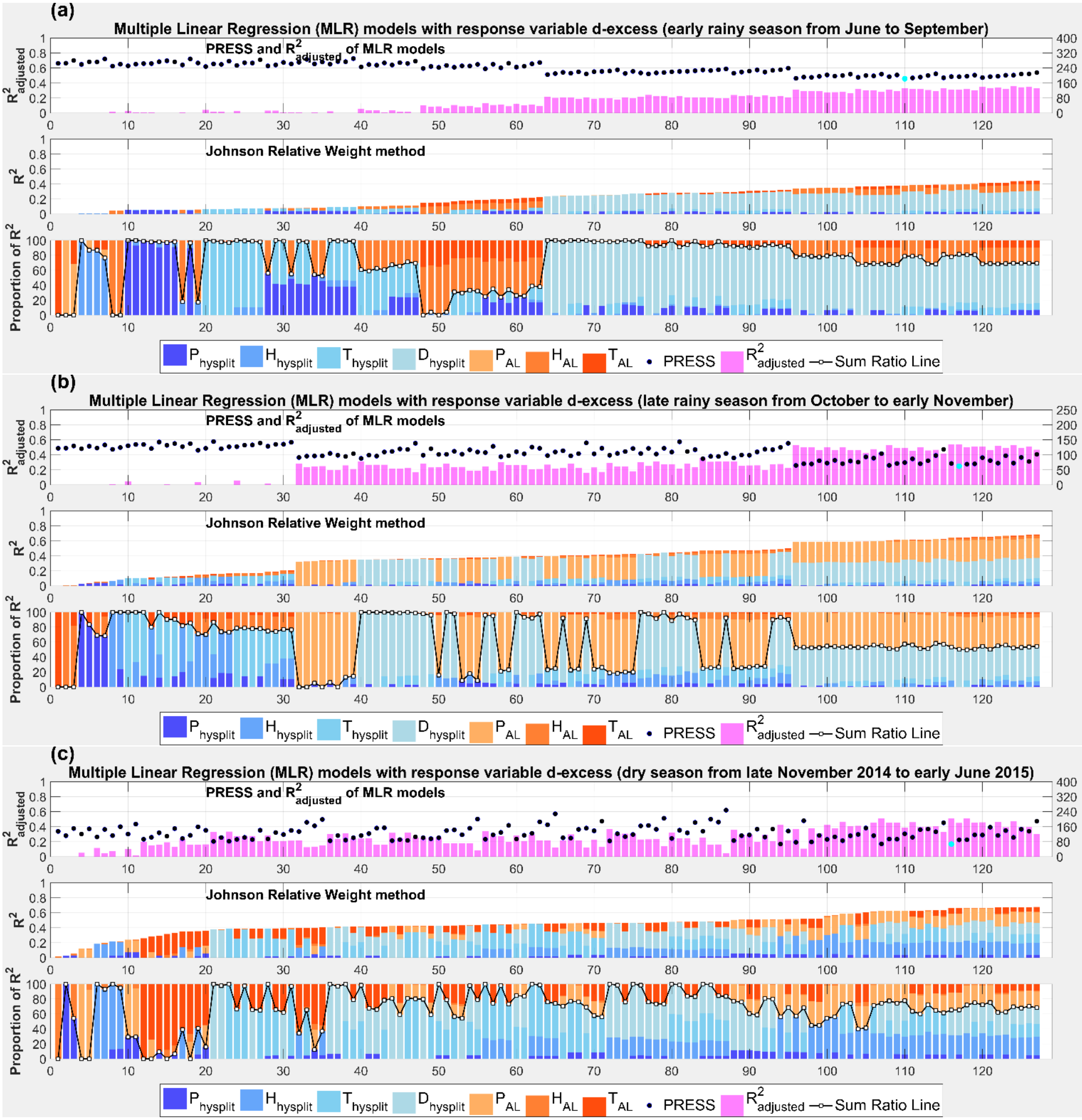

Figure S4: MLR with response variable d-excess and relative importance analysis applied for all possible subsets (127 MLR models) for different seasons: a) early monsoon from June to September, b) late monsoon from October to mid-November, and c) the dry season from mid-November to mid-June.

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