

Growing topography due to contrasting rock types in a tectonically dead landscape

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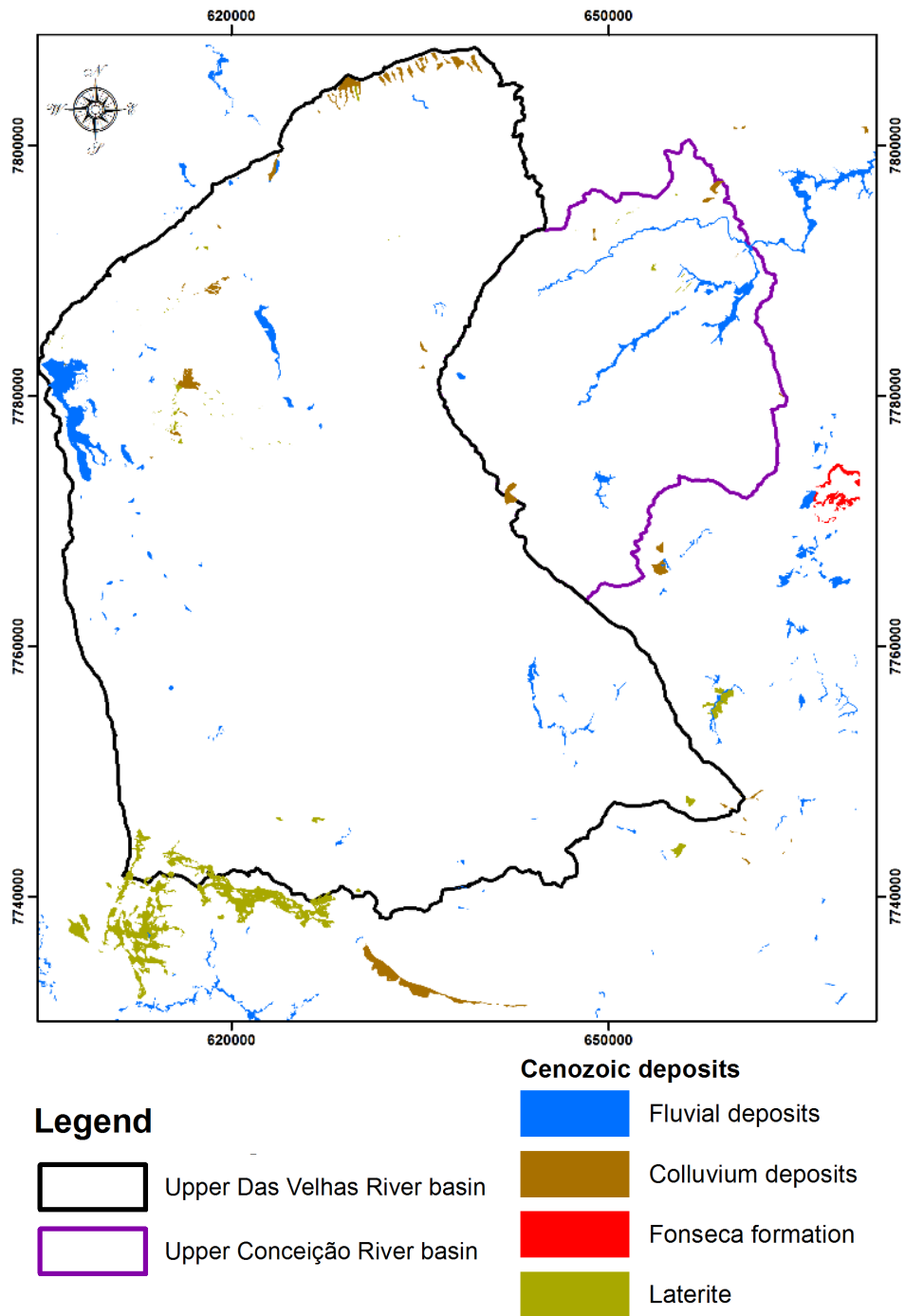
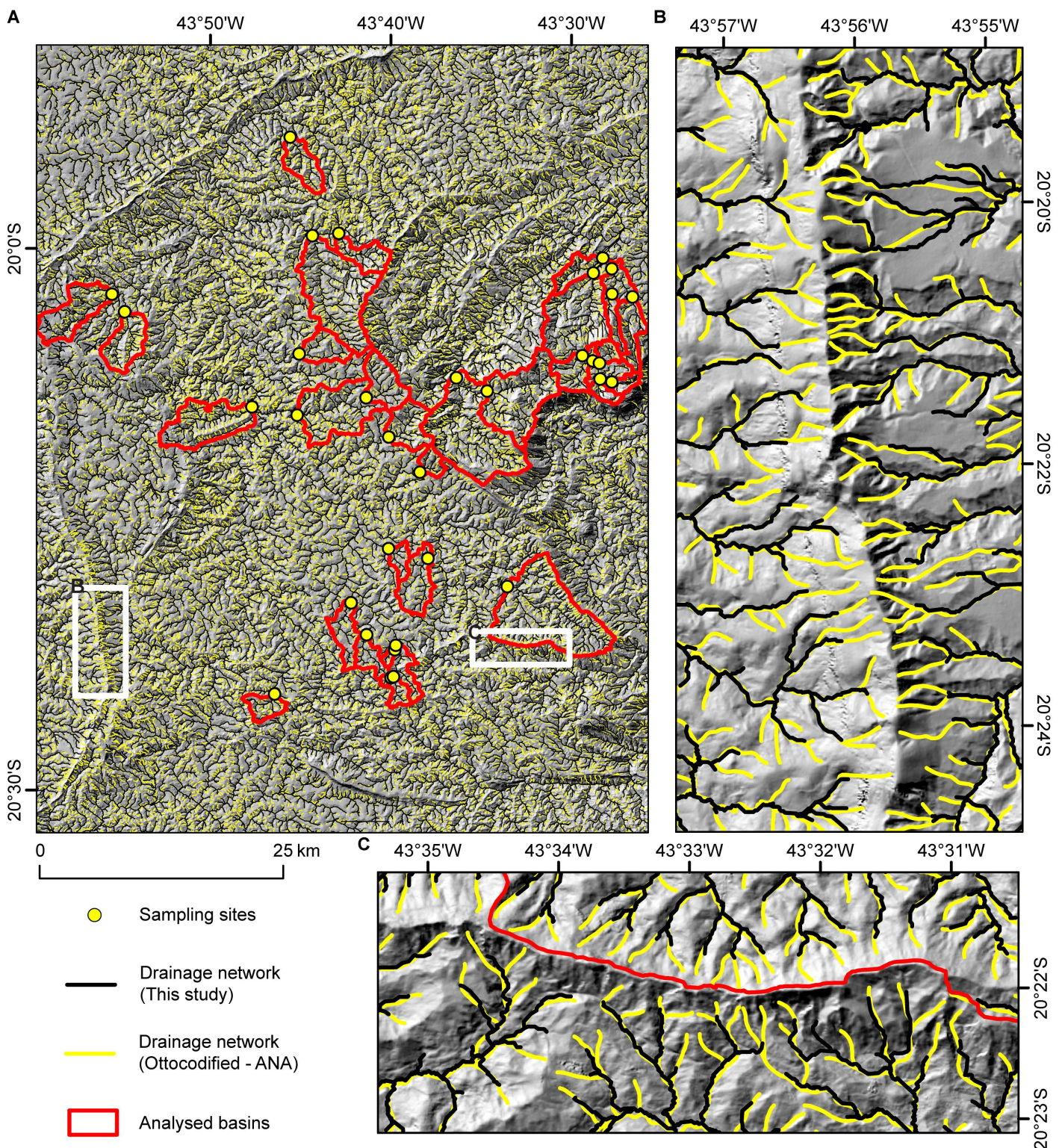
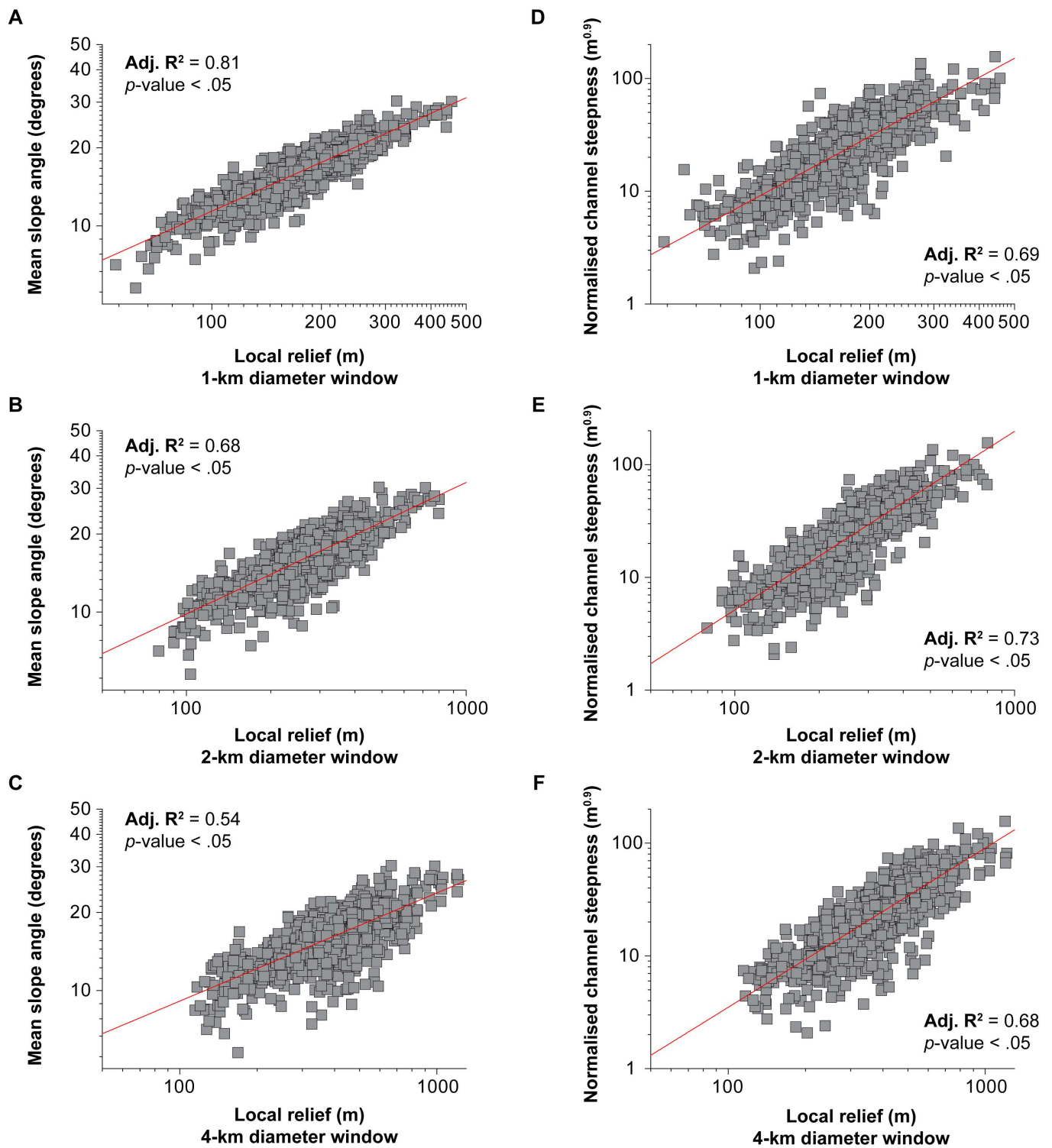


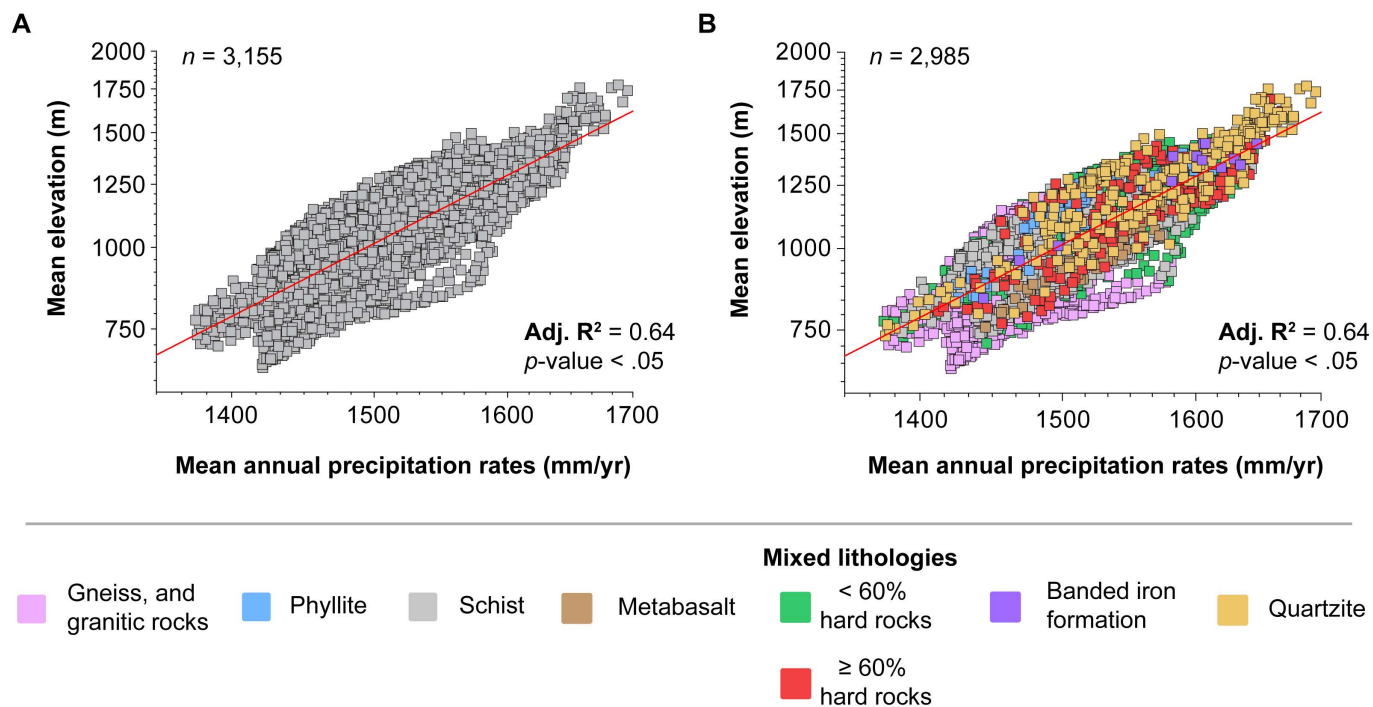
Figure S1: Spatial distribution of Cenozoic units in the QF, excluding iron duricrusts. Geological data: Lobato et al., 2005. The Fonseca formation refers to Eocene clayey and sandy lacustrine deposits often interpreted as tectonically controlled (e.g., Sant'anna et al., 1997).



25 **Figure S2: Comparison between the drainage network used in this study and Brazil's National Water Agency (ANA) drainage network based on topographic maps developed using aerophotogrammetry.** Note that channel heads in our drainage network, extracted using an area threshold of 0.5 km², are located, in all cases, downstream of where channel heads are situated in ANA's drainage network. Therefore, we interpret that we used a reasonable contributing area for extracting the drainage in the study area. Panels B and C were developed using a numerical scale of 1:80,000. Data source for ANA's drainage network: ANA (2017).



30 **Figure S3: Bivariate regressions between catchment-averaged mean slope angle and local relief (A, B, C), and catchment-averaged normalised channel steepness and local relief (D, E, F).** The diameter of the circular window used for the calculation of local relief is: (A, D) 1 km, (B, E) 2 km, (C, F) 4 km. Increasing the window diameter decreases the R^2 of local relief against mean slope angle. In contrast, the 2-km diameter window local relief dataset exhibits the highest R^2 with the normalised channel steepness (E); this is thus the window we used in the study. Grey circles represent every basin with order higher than 2nd-order for the QF ($n = 3,155$).



35 **Figure S4: Bivariate regressions between catchment-averaged elevation and mean annual precipitation rates.** Panel (A) represents all catchments in the study area with stream-order higher than second-order while panel (C) shows catchments underlain by main lithologies exposed in the study area. Mixed lithologies refer to catchments where a single rock-type does not account for $\geq 75\%$ of the catchment area.

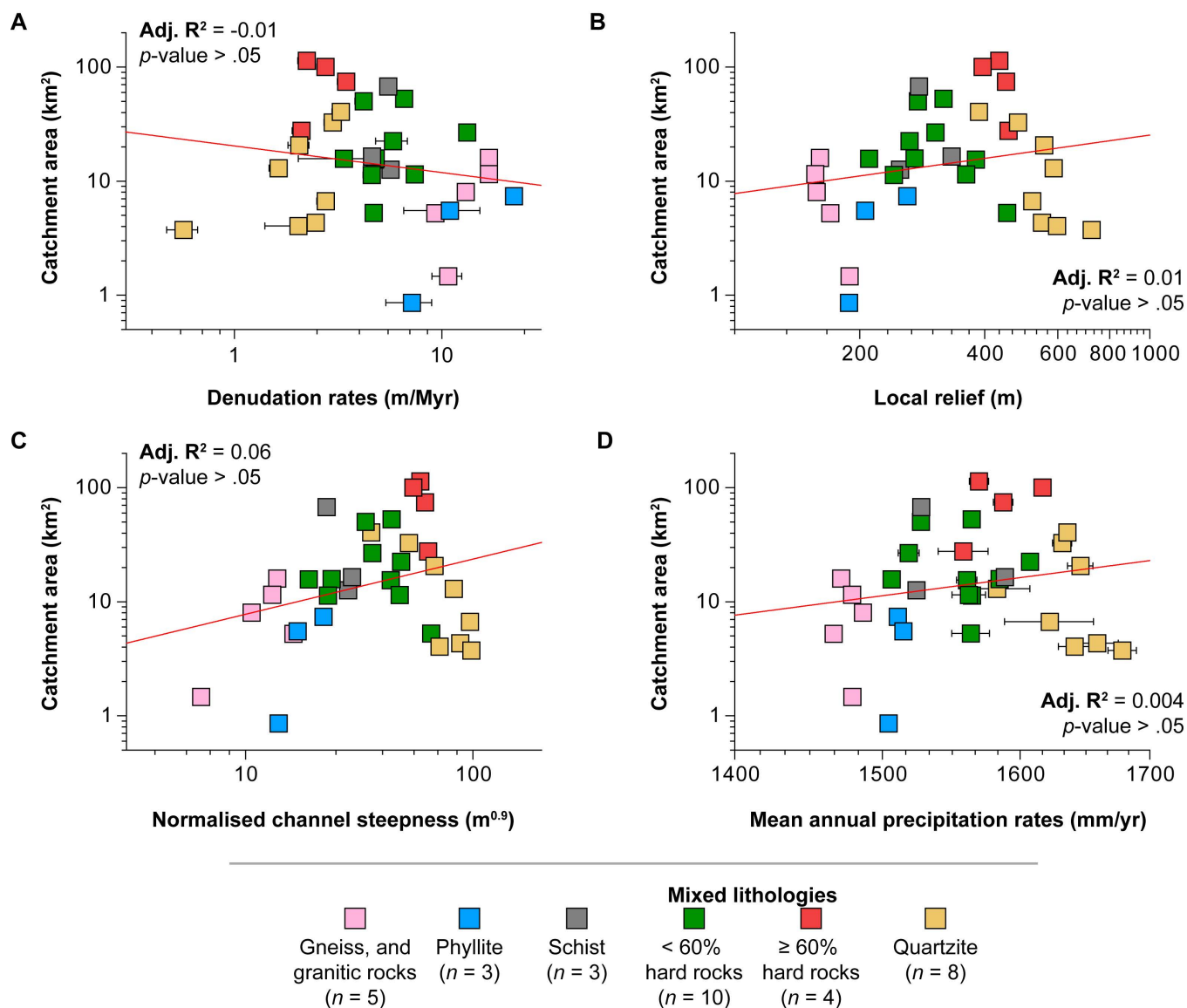


Fig. S5: Log-linear correlations between basin area and denudation rates (panel A), and basin area and geomorphic parameters (panels B-D). Note that none of the relationships between catchment area and geomorphic parameters is statistically significant at a .05 level. X-error bars represent external uncertainty in denudation rates in panel (A), and the standard error of the mean in panels (B), (C), and (D).

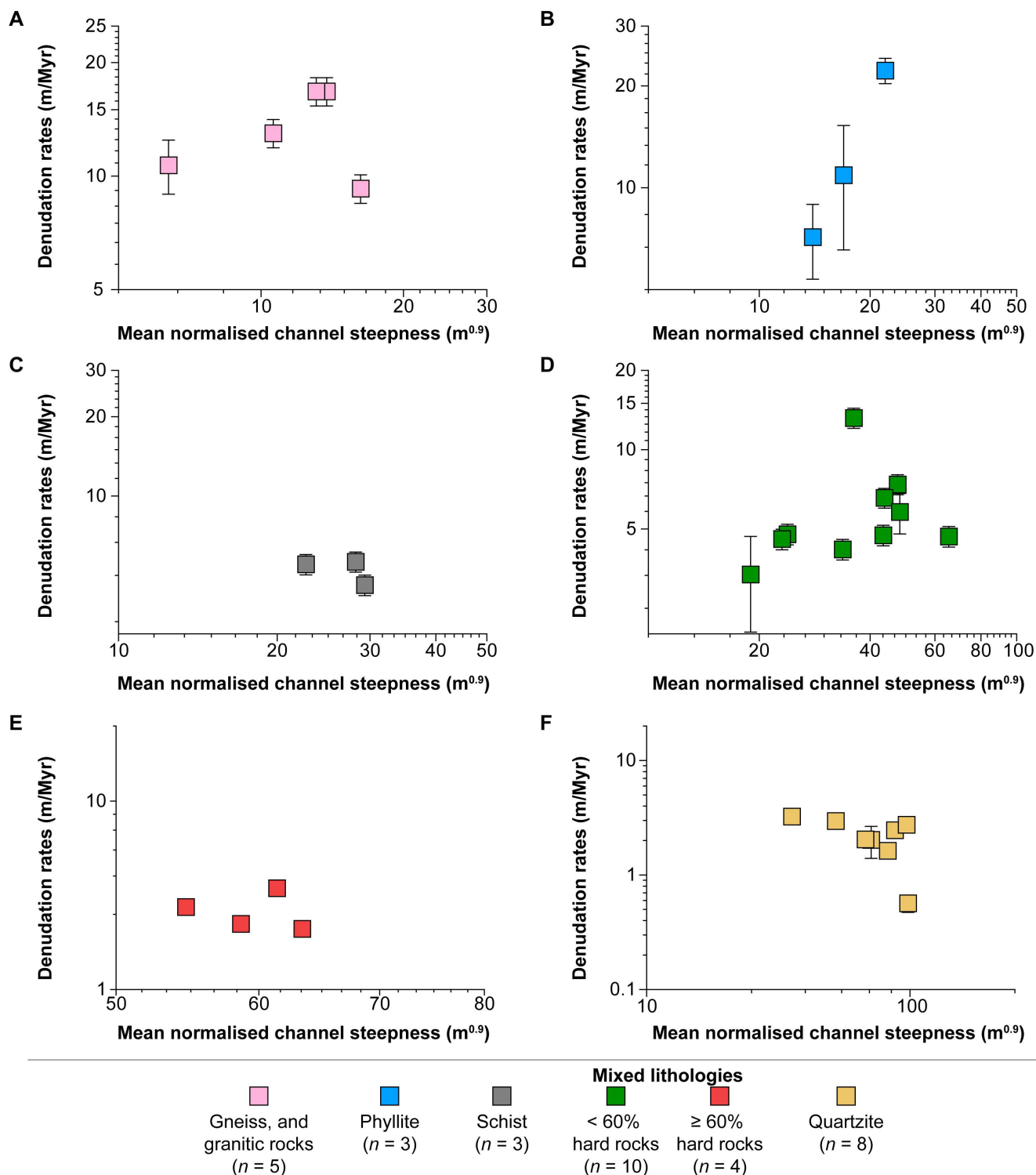
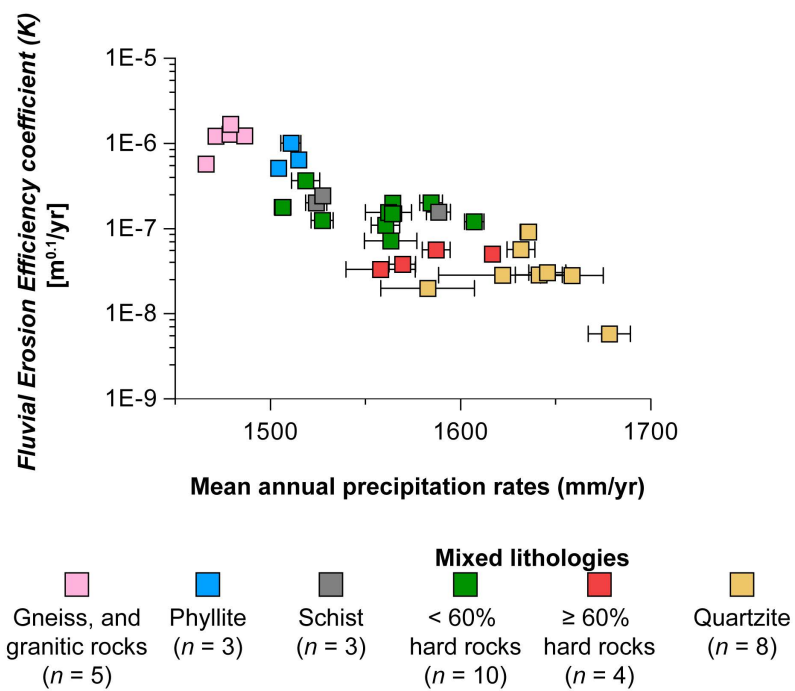


Fig. S6: Variations in catchment-averaged denudation rates with mean normalised channel steepness for individual rock types. Y-error bars show measurement uncertainties in the nuclide concentration as well as uncertainties related to the scaling method. Mixed lithology refers to catchments where a single lithology does not account for $\geq 75\%$ of the catchment area.



45 **Figure S7: Scatter plot between catchment-averaged fluvial erosion efficiency coefficient (K) against mean annual precipitation rates.** Note that we assumed $n = 1$. X-error bars represent the standard error of the mean.

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