Technical Note – RAT: a Robustness Assessment Test for calibrated and uncalibrated hydrological models

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Supplementary Material 1: plots showing streamflow bias obtained with the RAT and the GSST as a function of temperature, precipitation and humidity index anomalies, for all test catchments

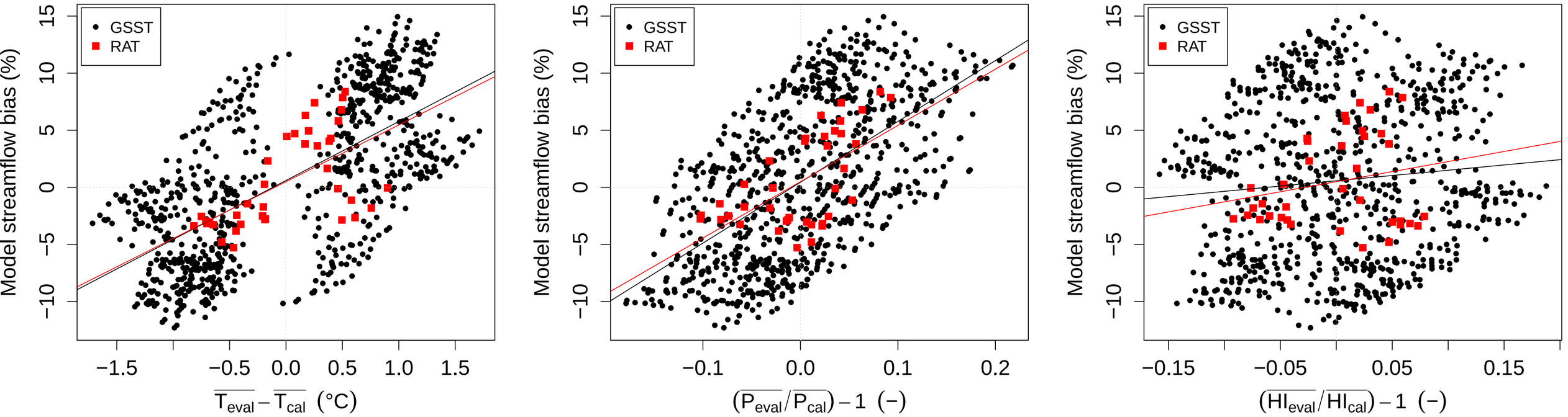

Figure 1. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment A1080330

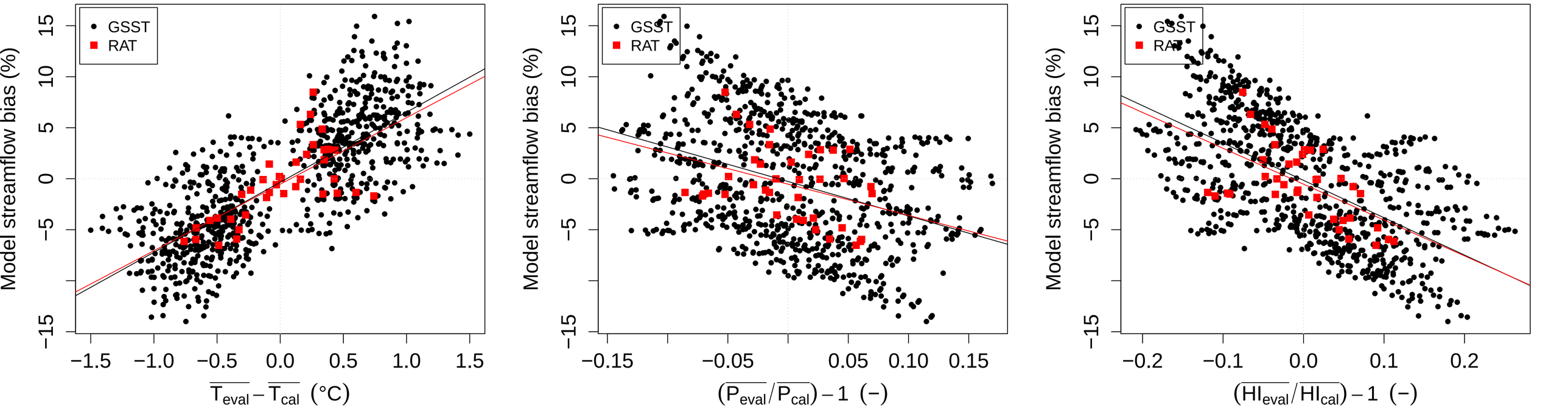

Figure 2. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment B2220010

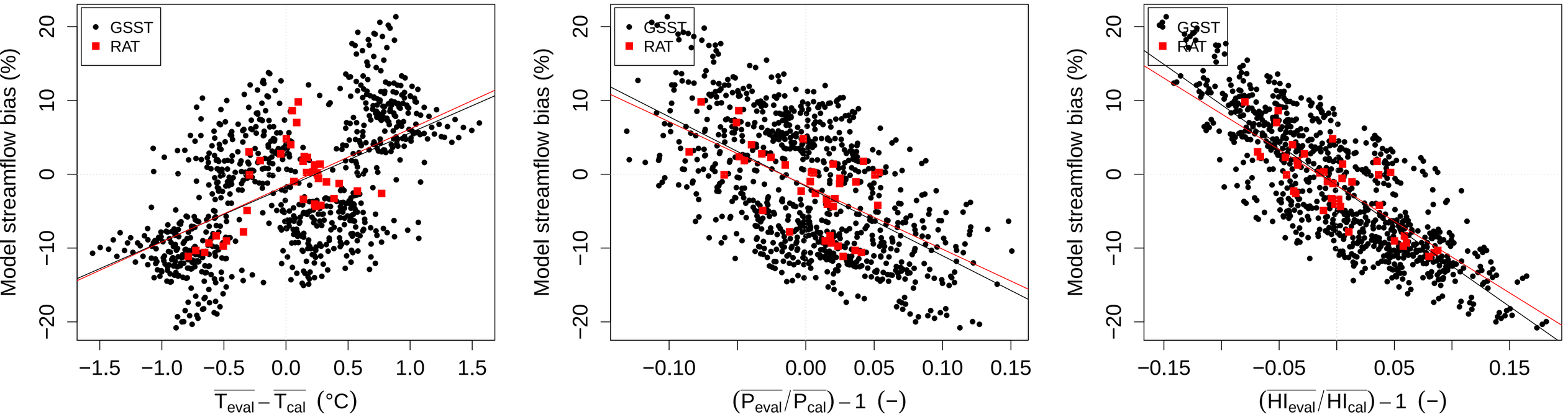

Figure 3. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment H2342020

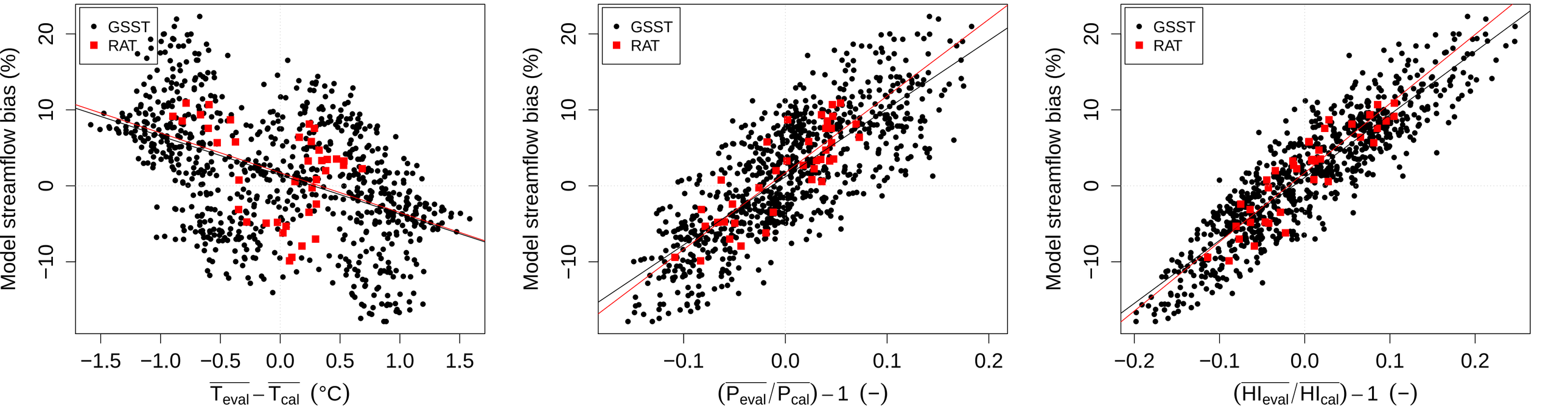

Figure 4. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment H4252010

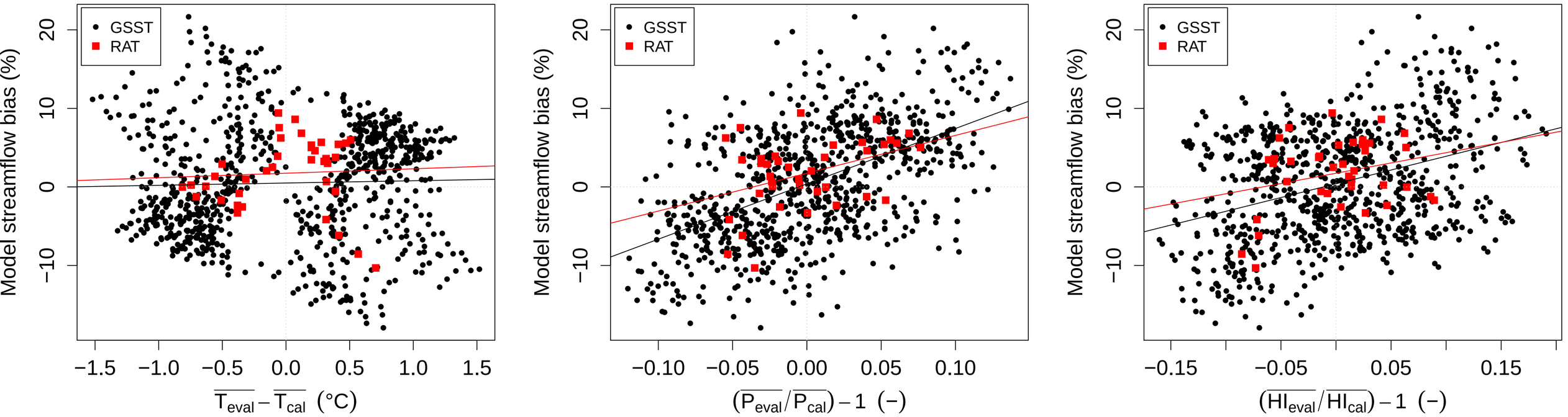

Figure 5. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment H7401010

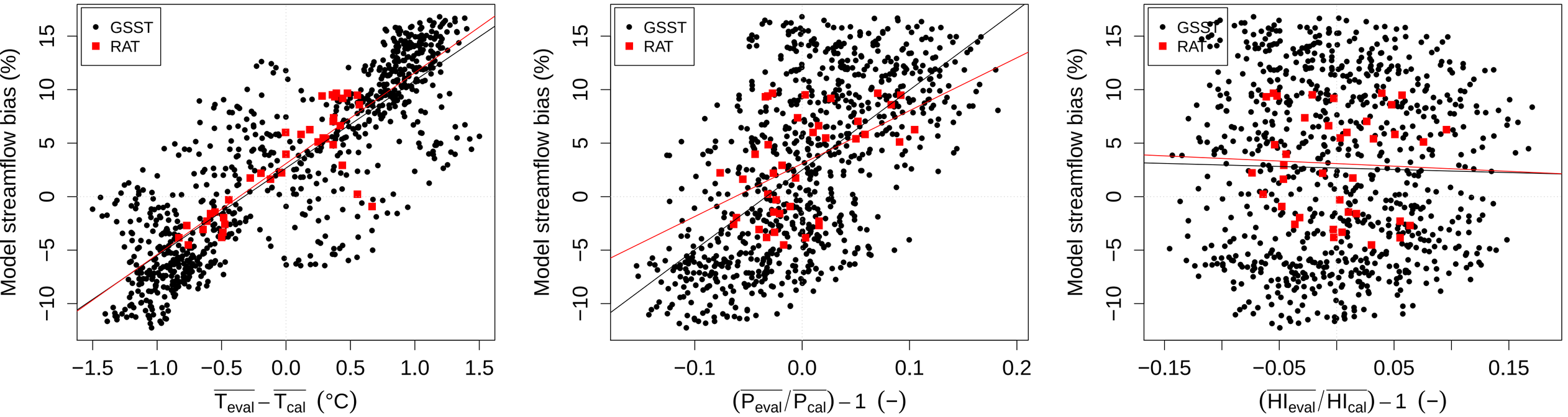

Figure 6. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment H8212010

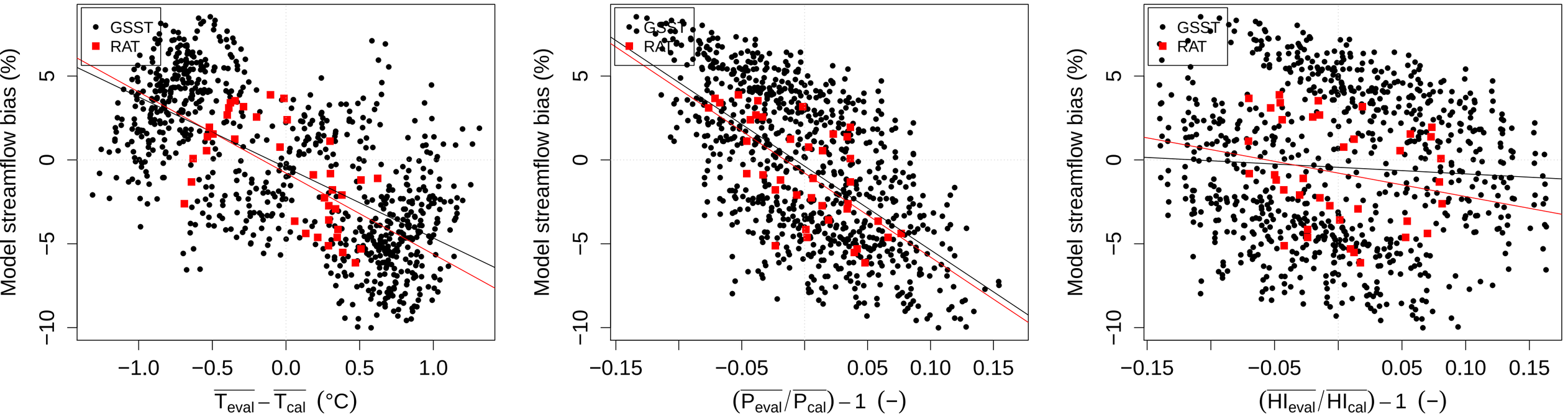

Figure 7. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment I5221010

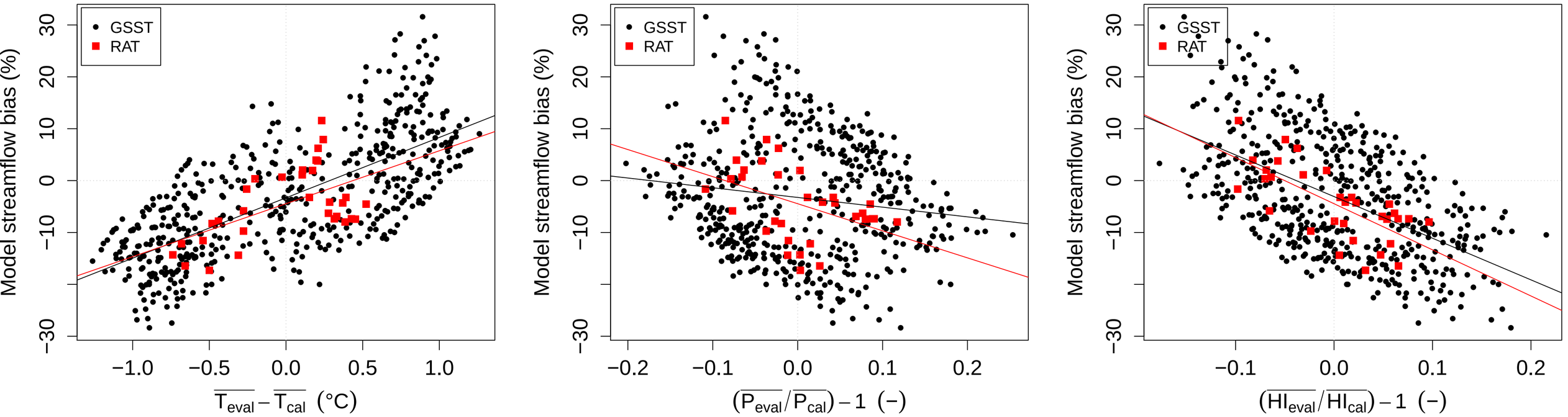

Figure 8. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment J7483010

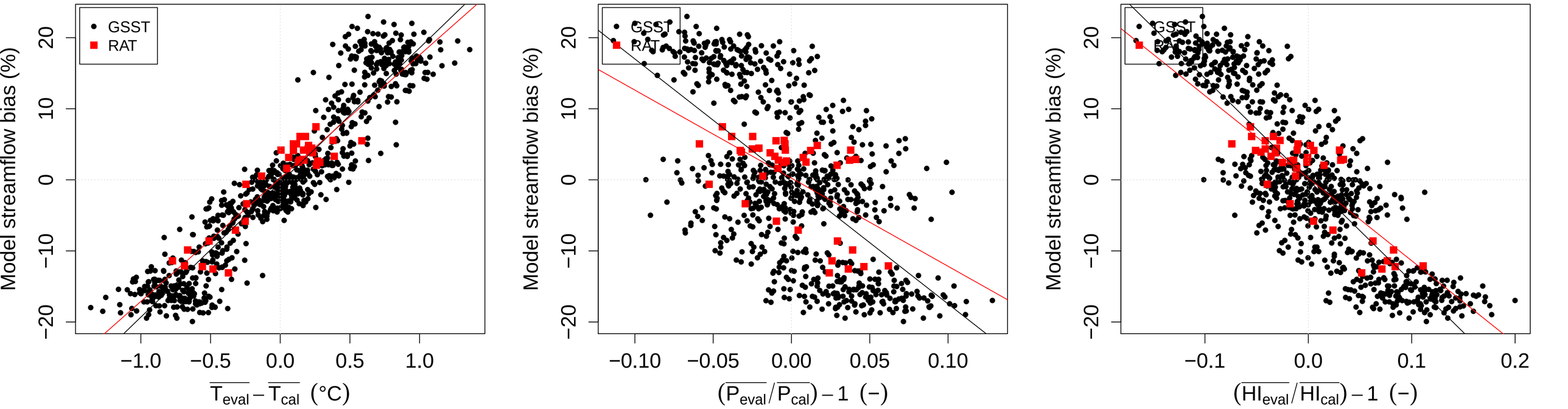

Figure 9. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment K1321810

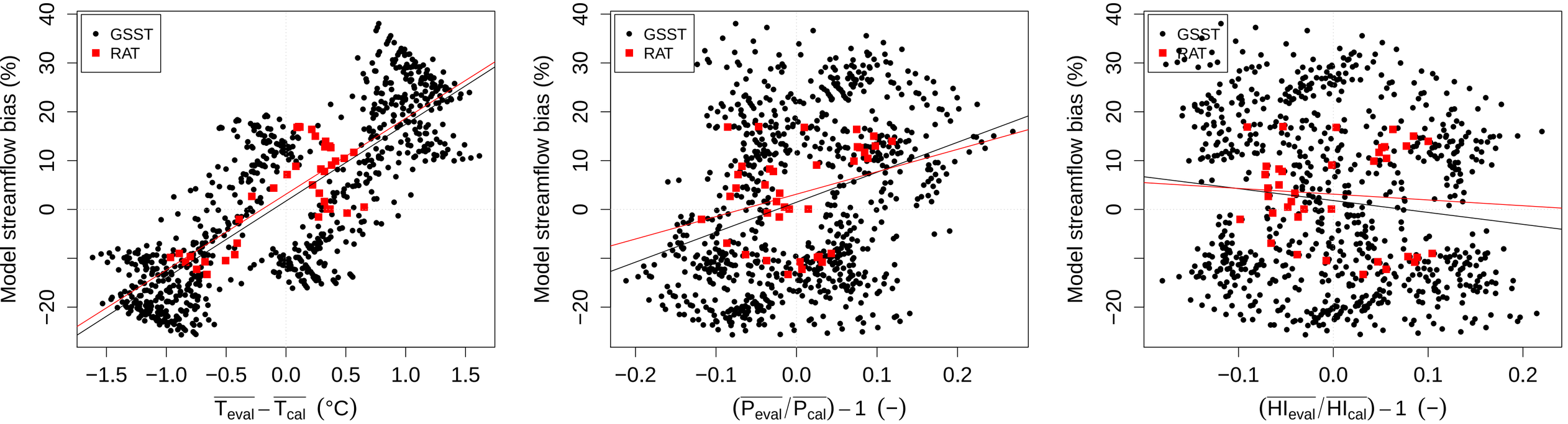

Figure 10. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment K6402520

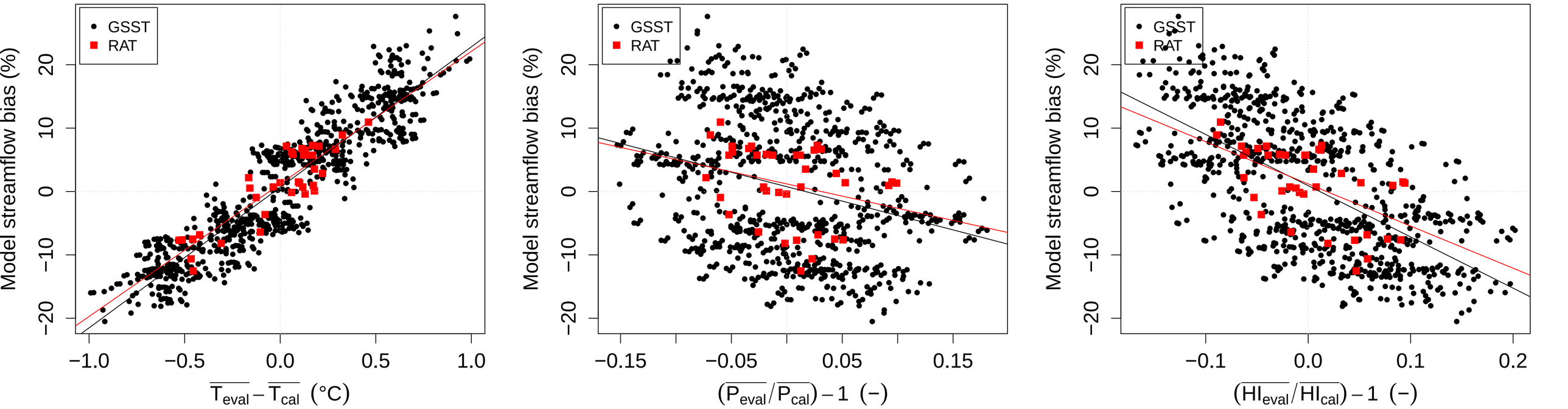

Figure 11. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment L0563010

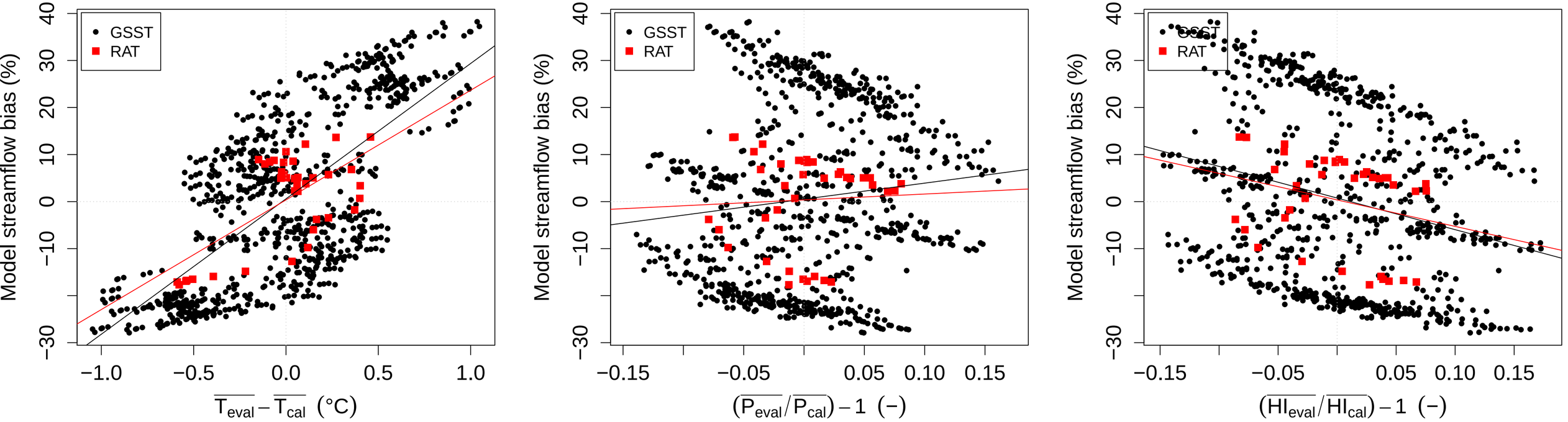

Figure 12. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment L4411710

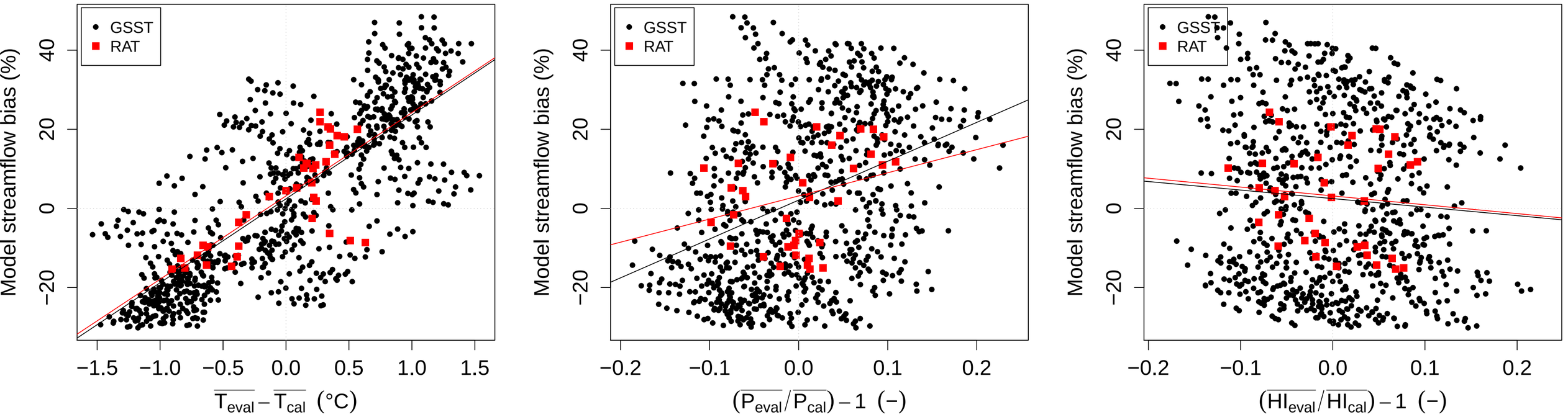

Figure 13. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment M0243010

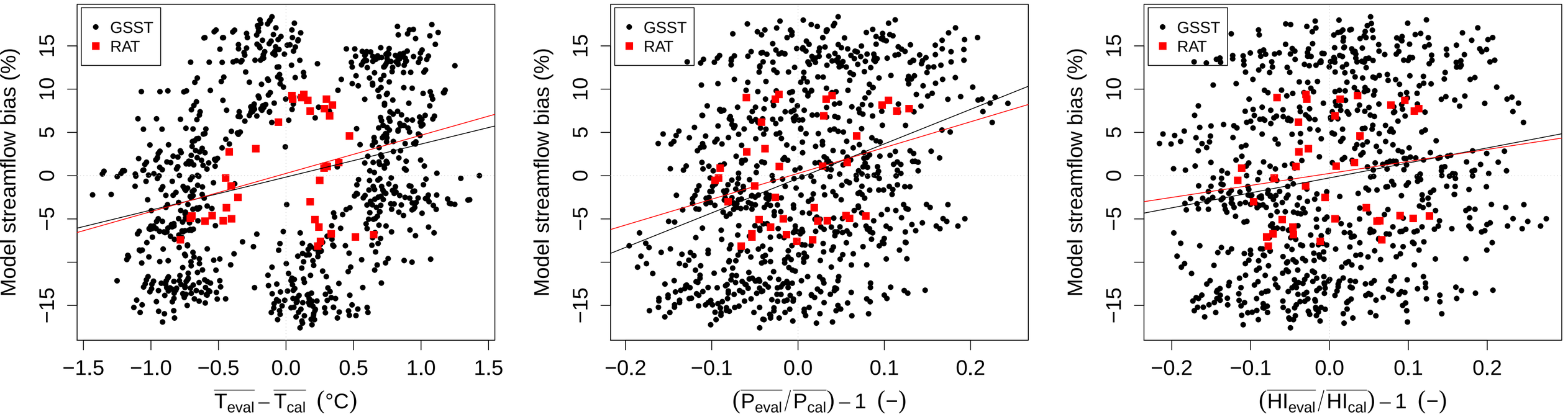

Figure 14. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment M7112410

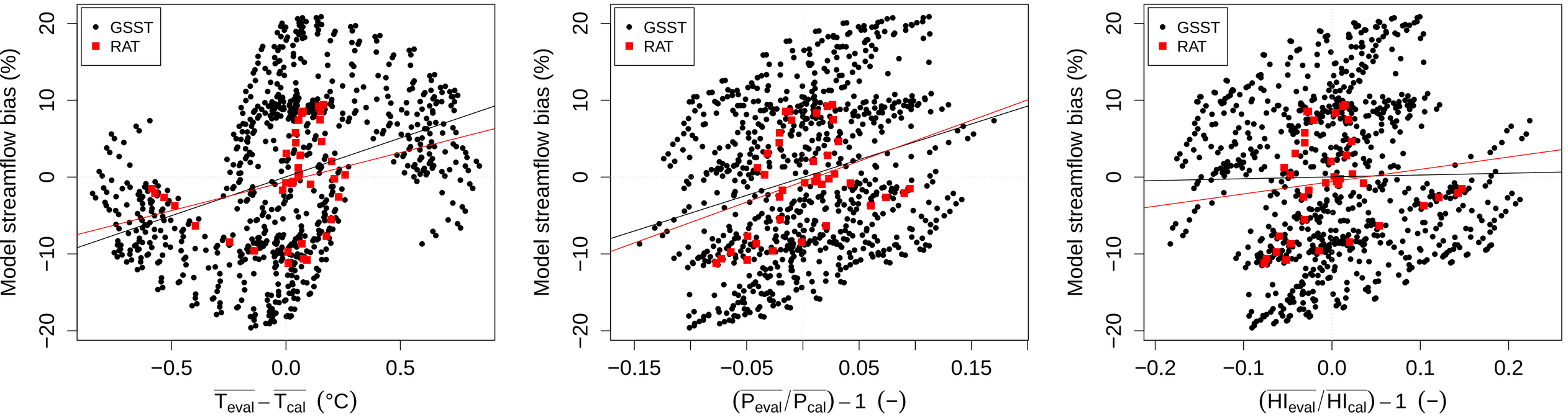

Figure 15. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment O0592510

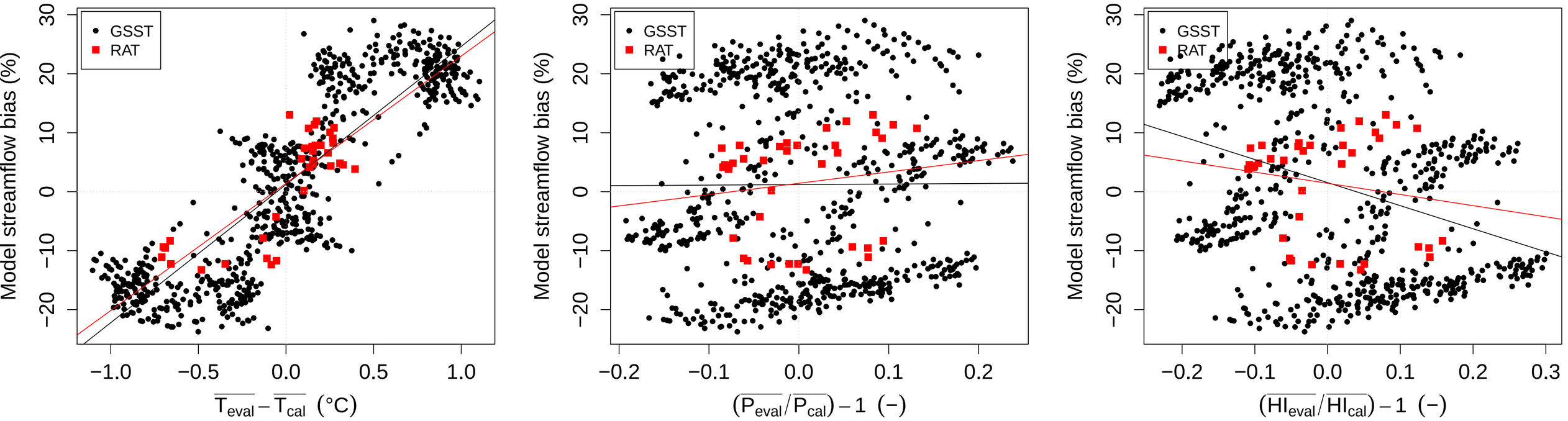

Figure 16. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment O7101510

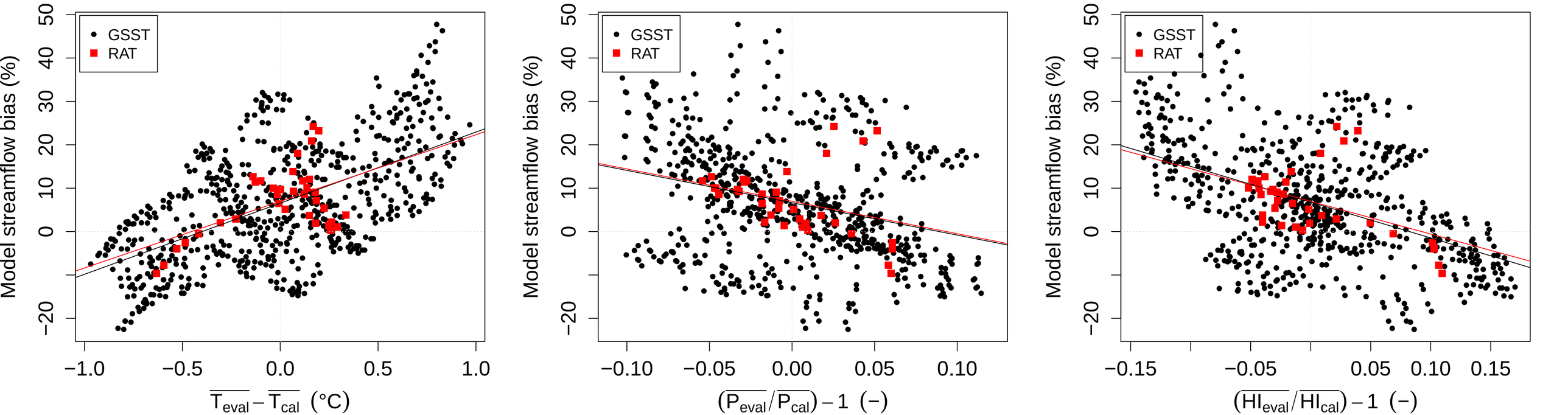

Figure 17. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment Q5501010

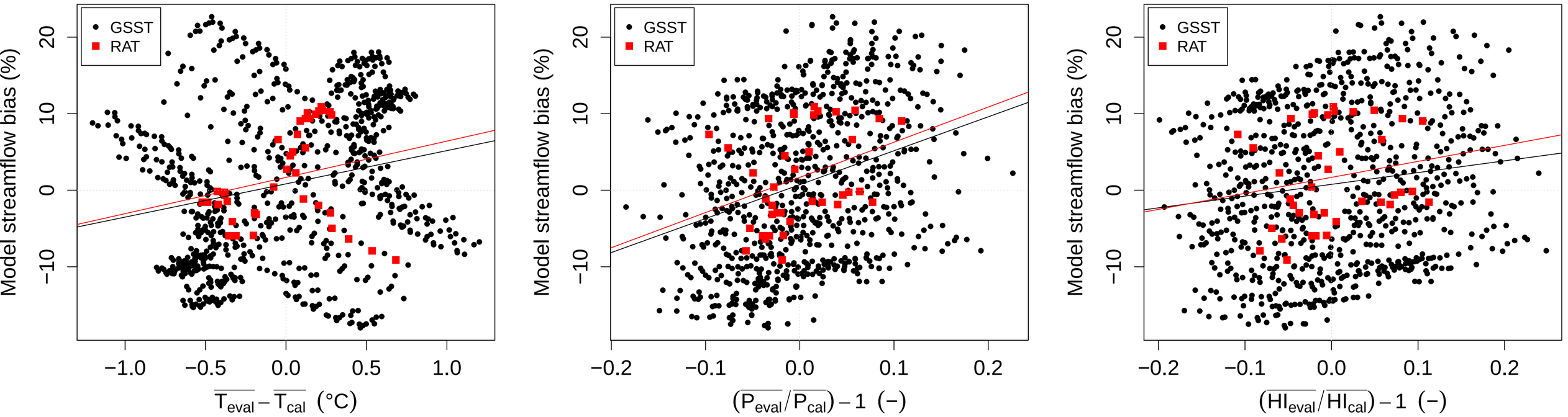

Figure 18. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment S2242510

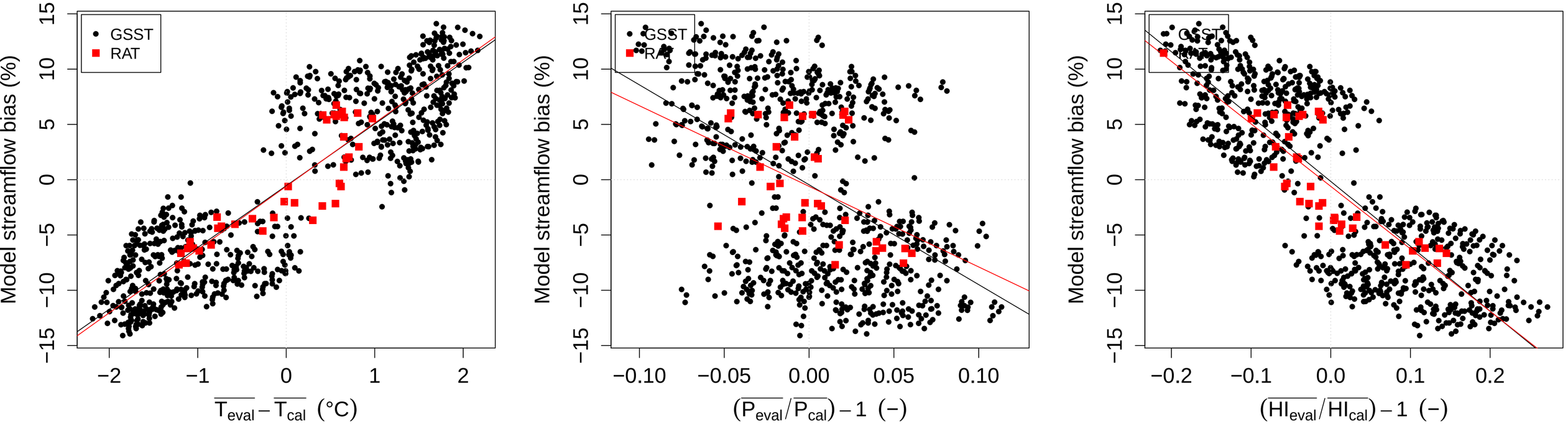

Figure 19. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment U4644010

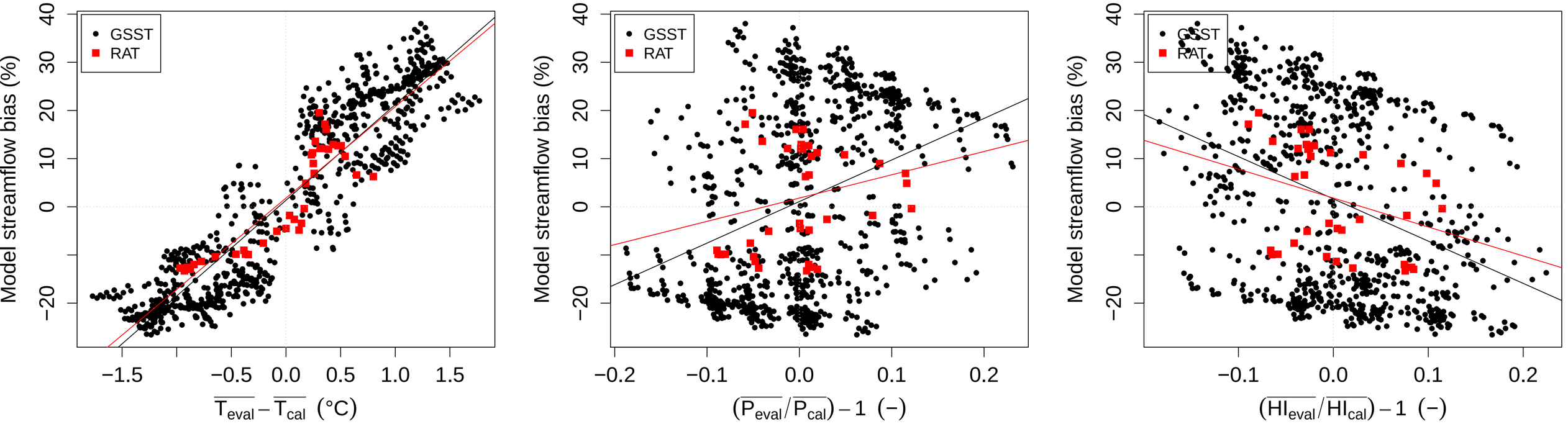

Figure 20. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment V4264010

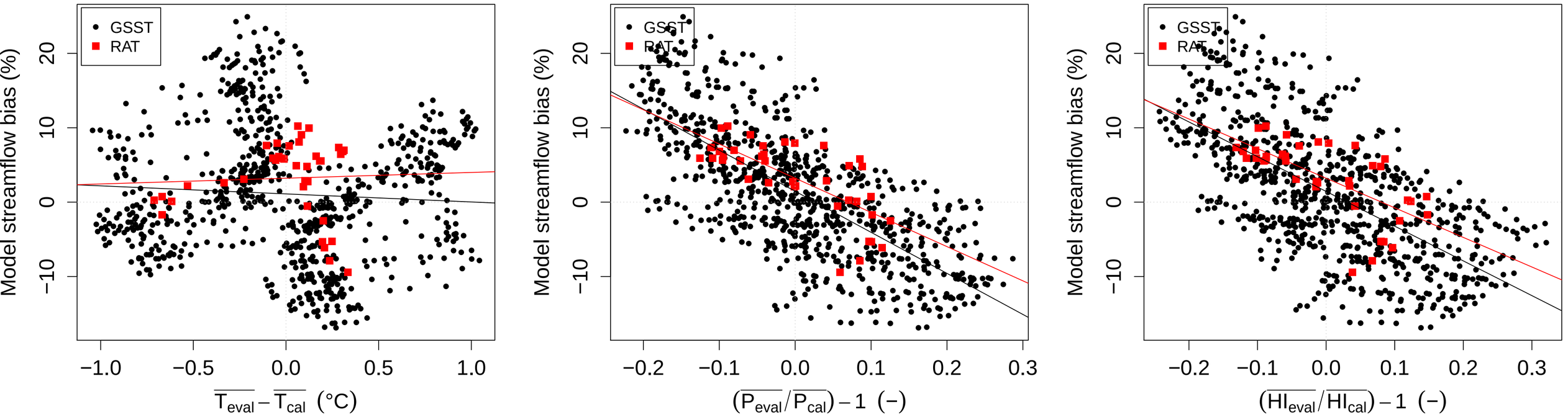

Figure 21. Streamflow bias obtained with the RAT (red squares) and the GSST (black dots), as a function of temperature, precipitation and humidity index anomalies, for the catchment Y4624010

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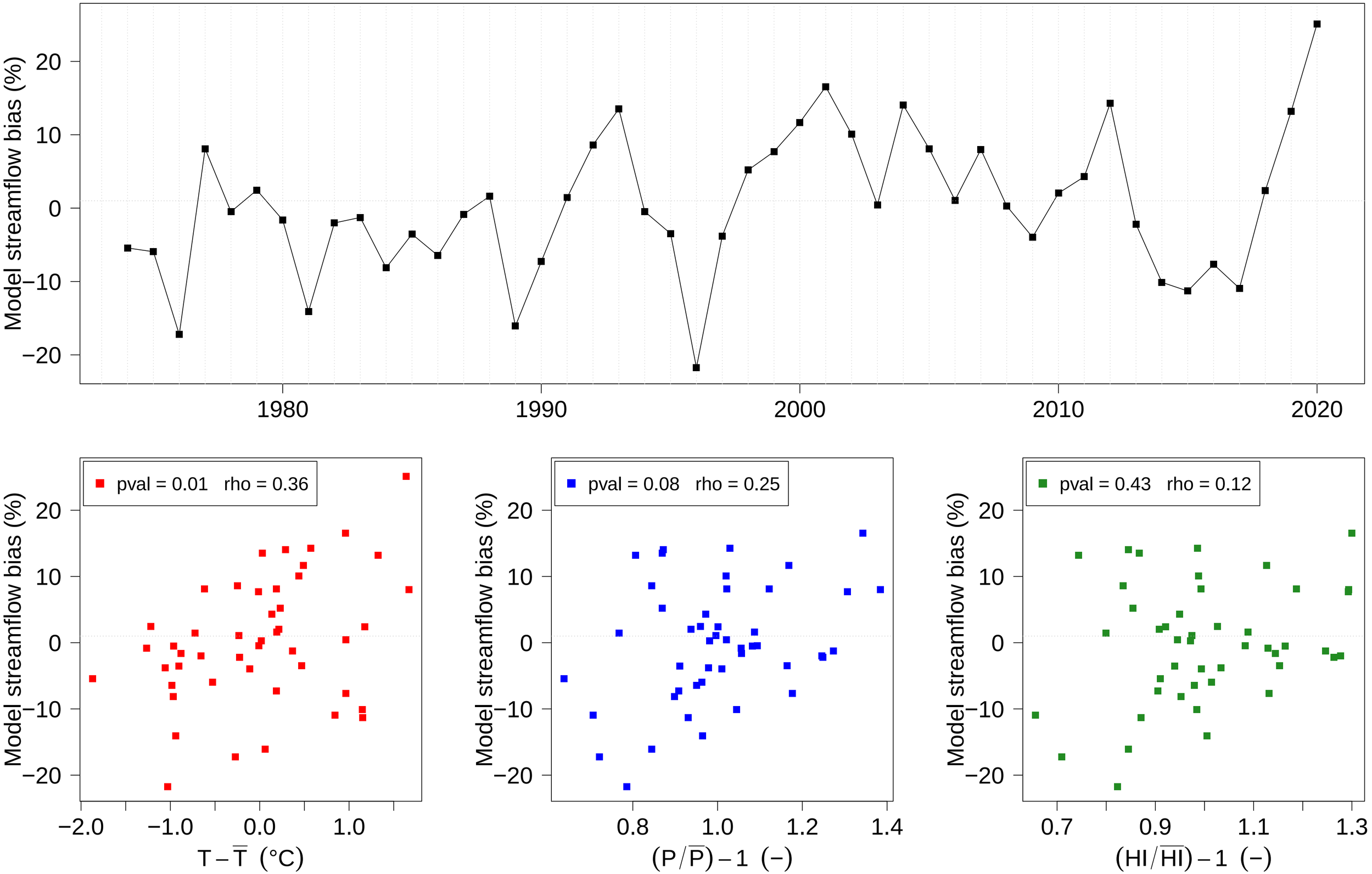
Supplementary Material 2: Plots showing streamflow annual bias obtained with the RAT function of (i) time, (ii) temperature anomalies (iii) precipitation anomalies (iv) humidity index anomalies, for all test catchments



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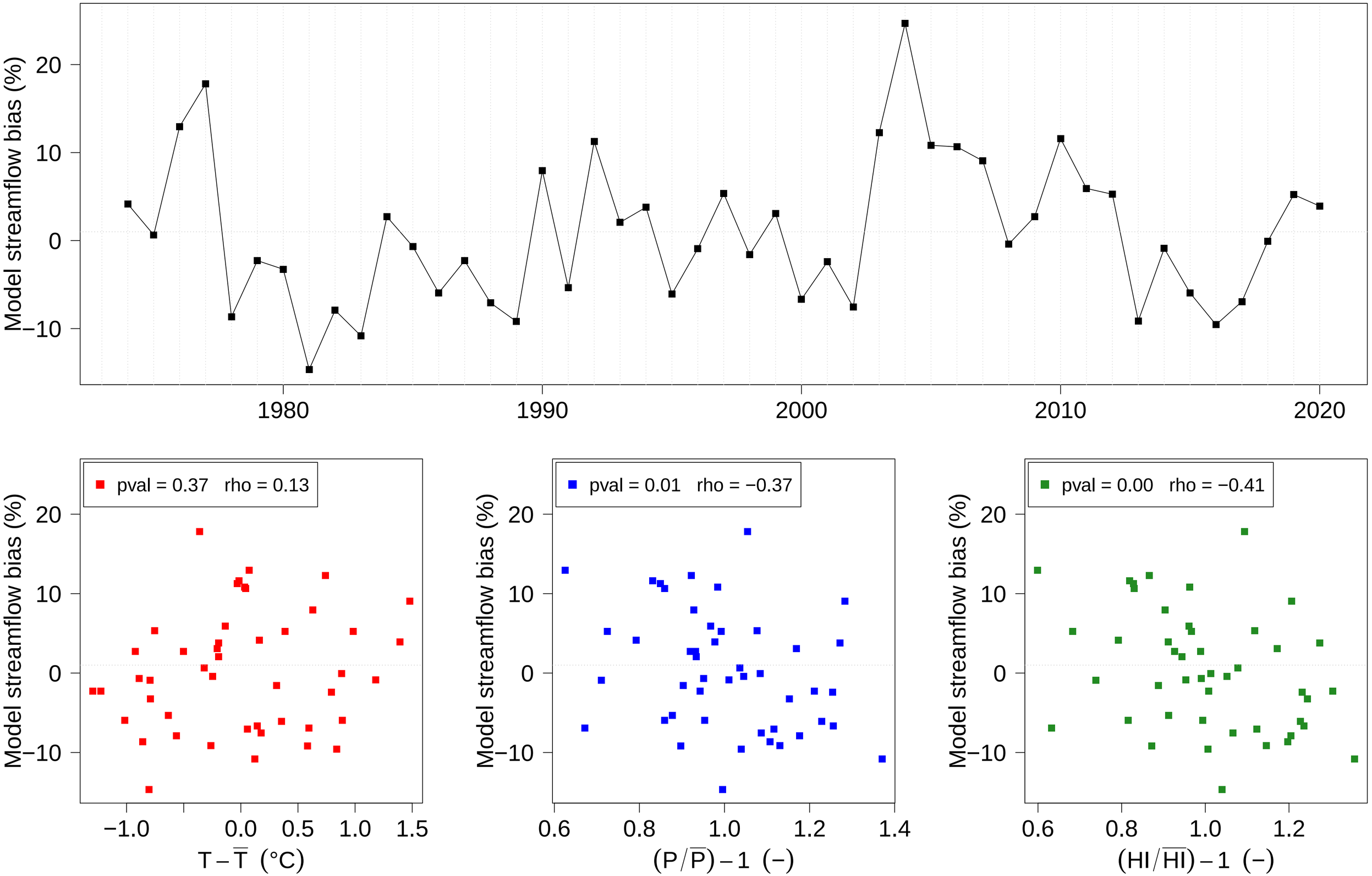

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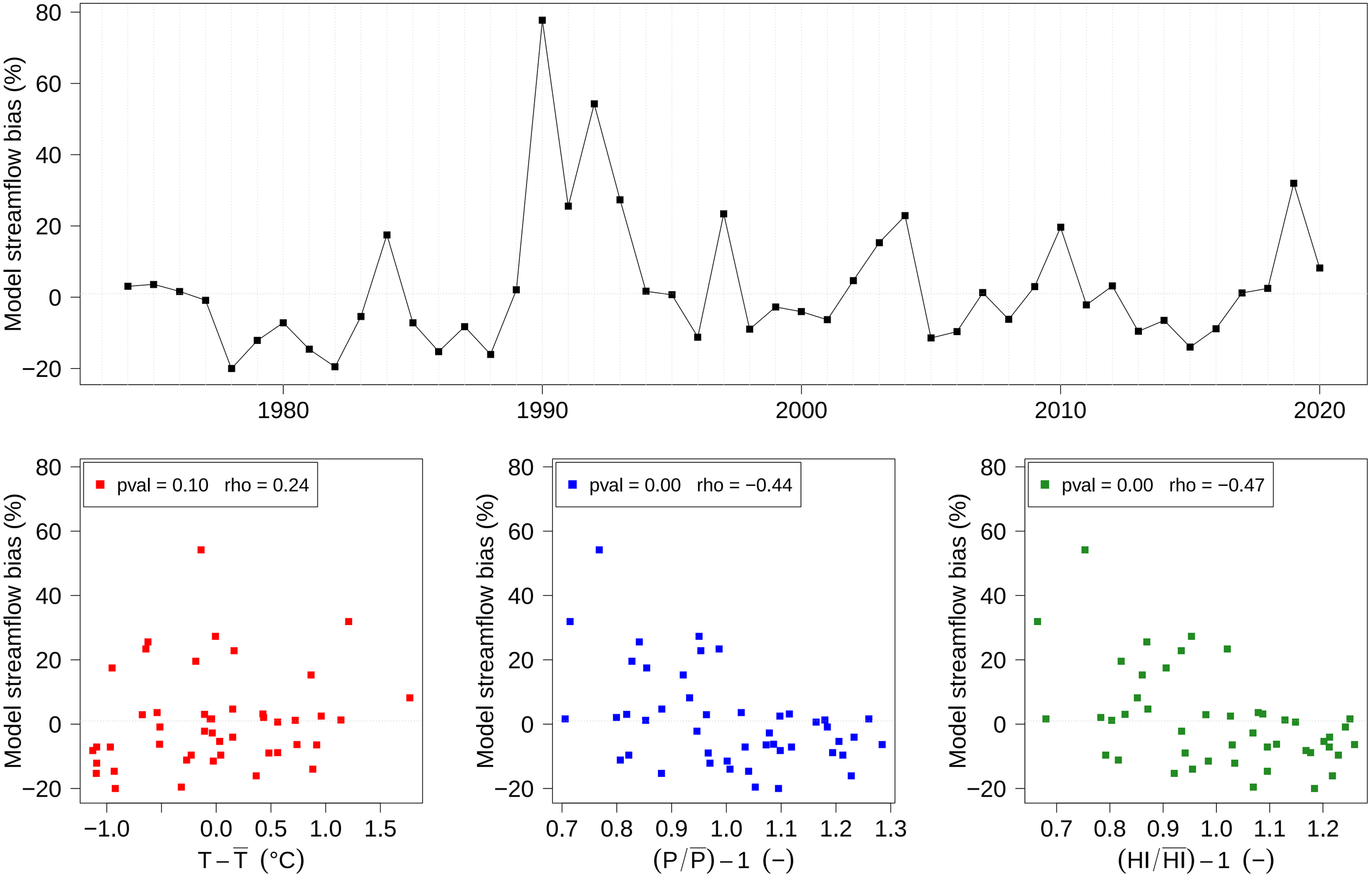

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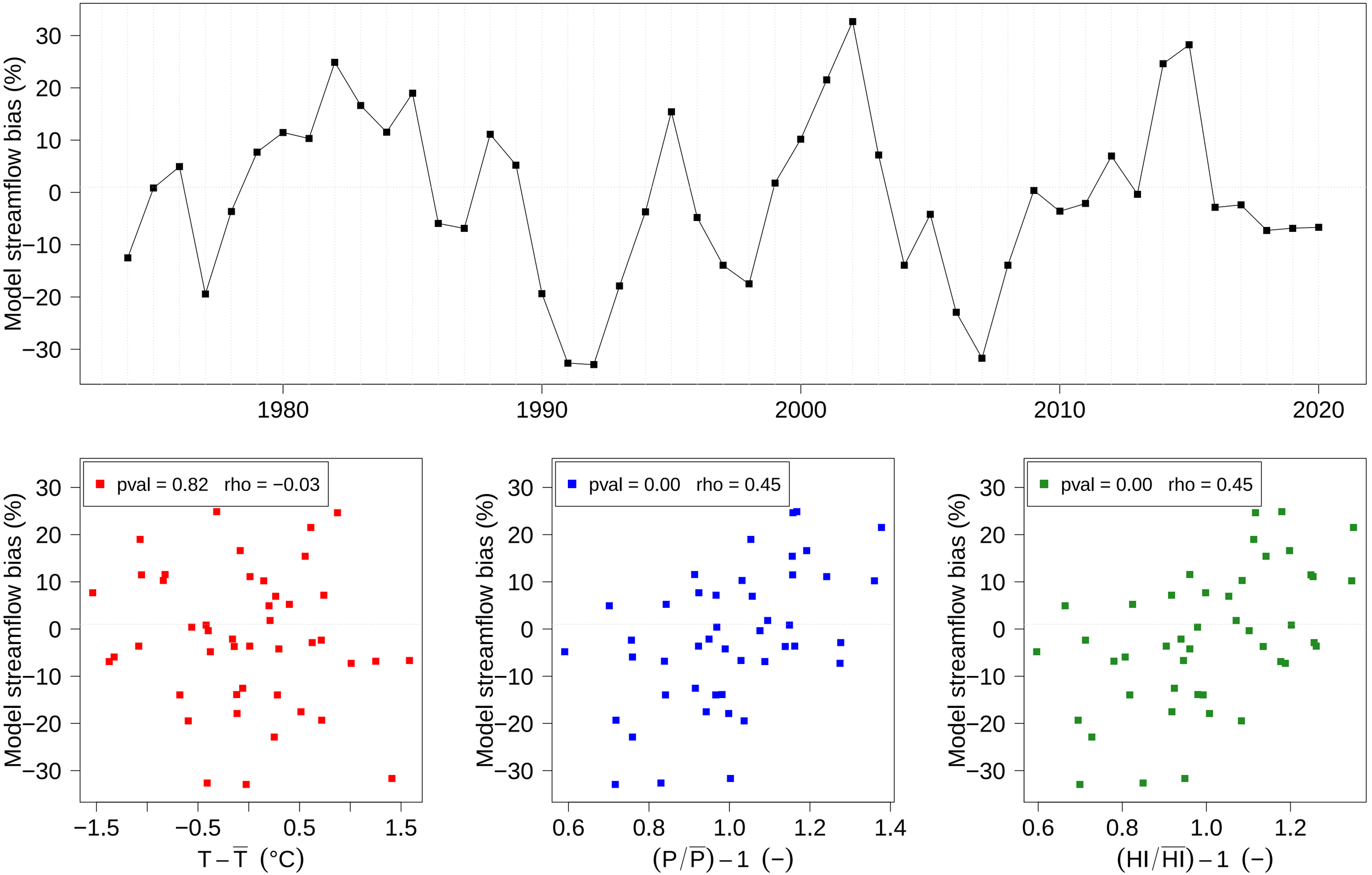

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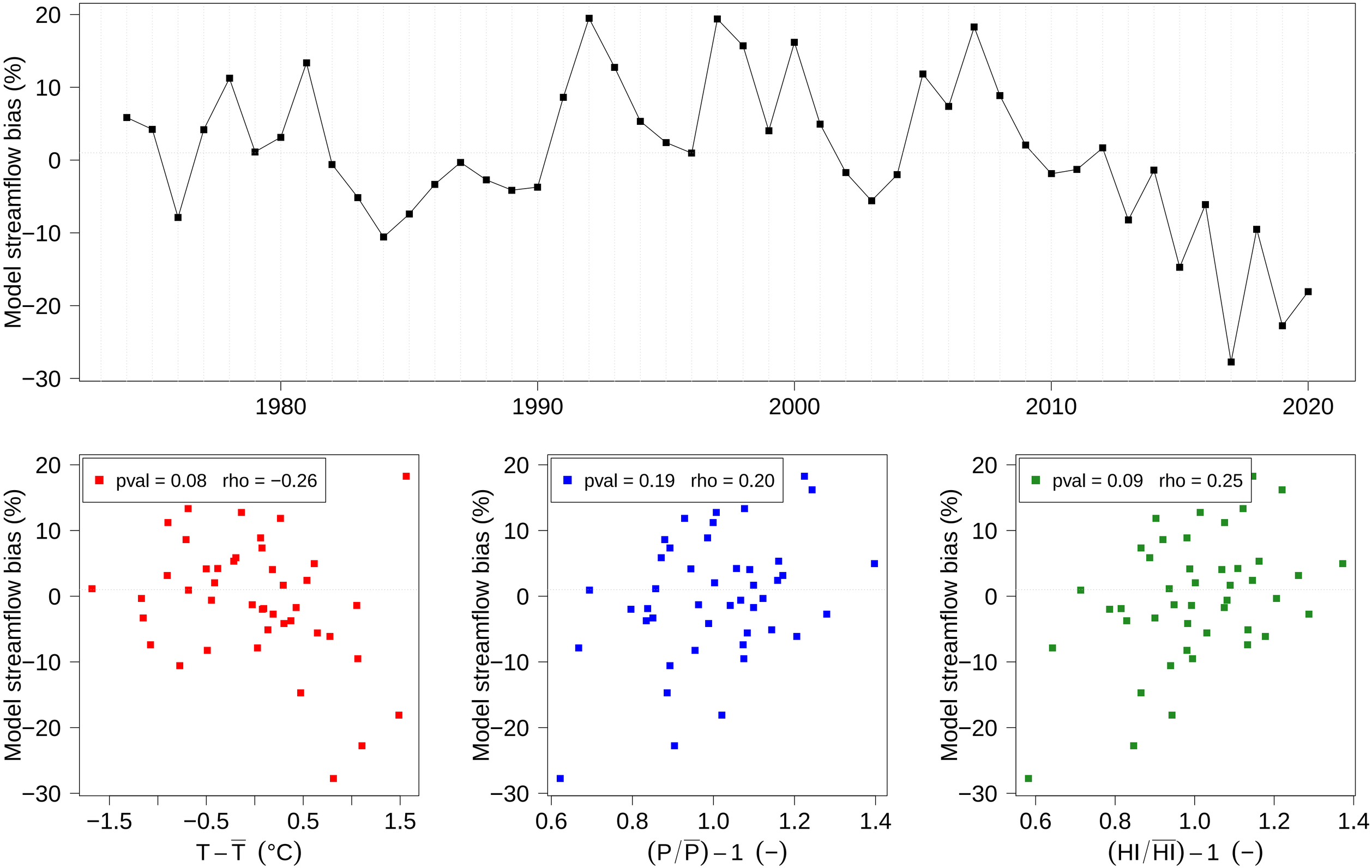


Figure 5. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment H7401010

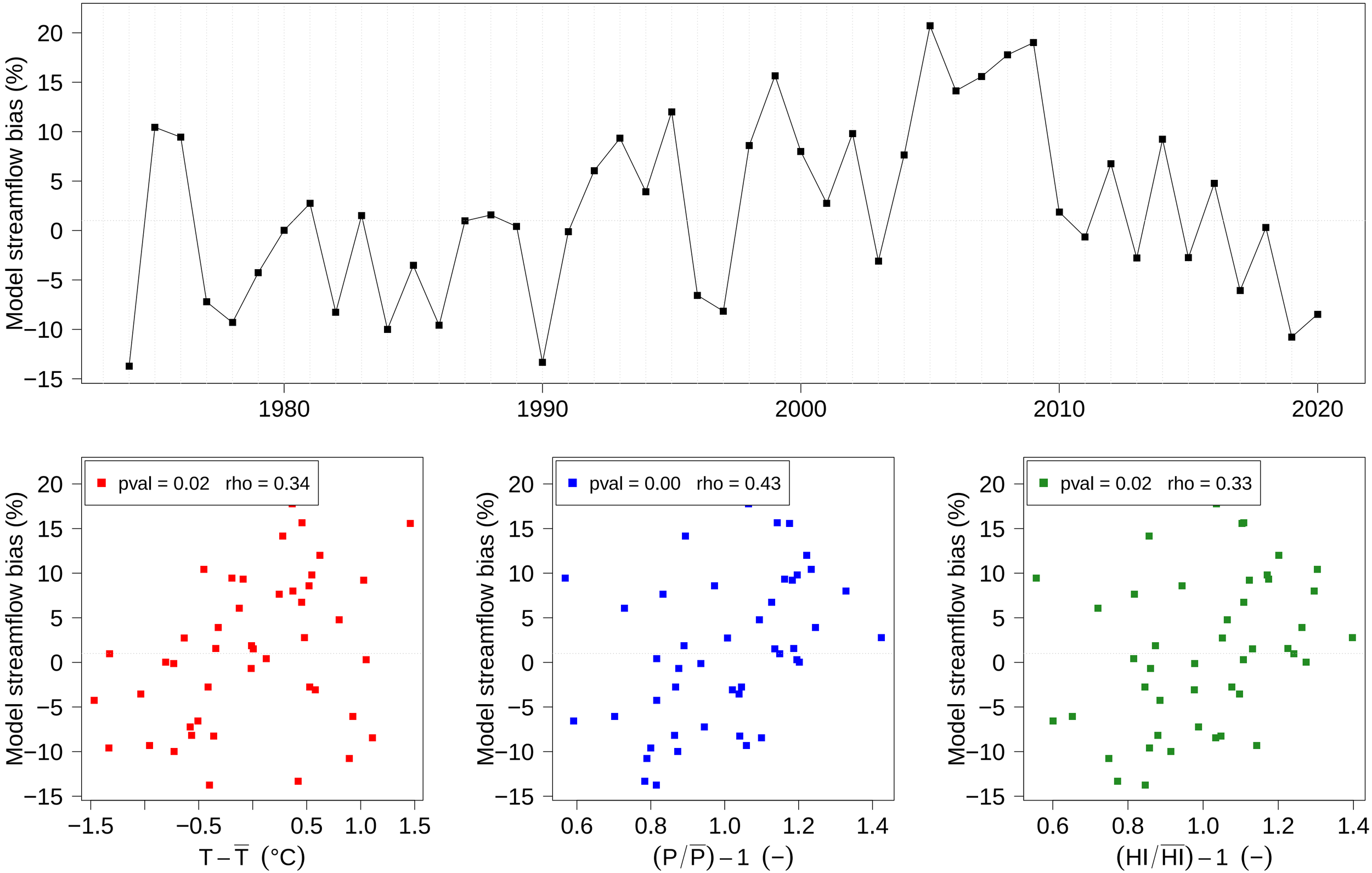


Figure 6. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment H8212010

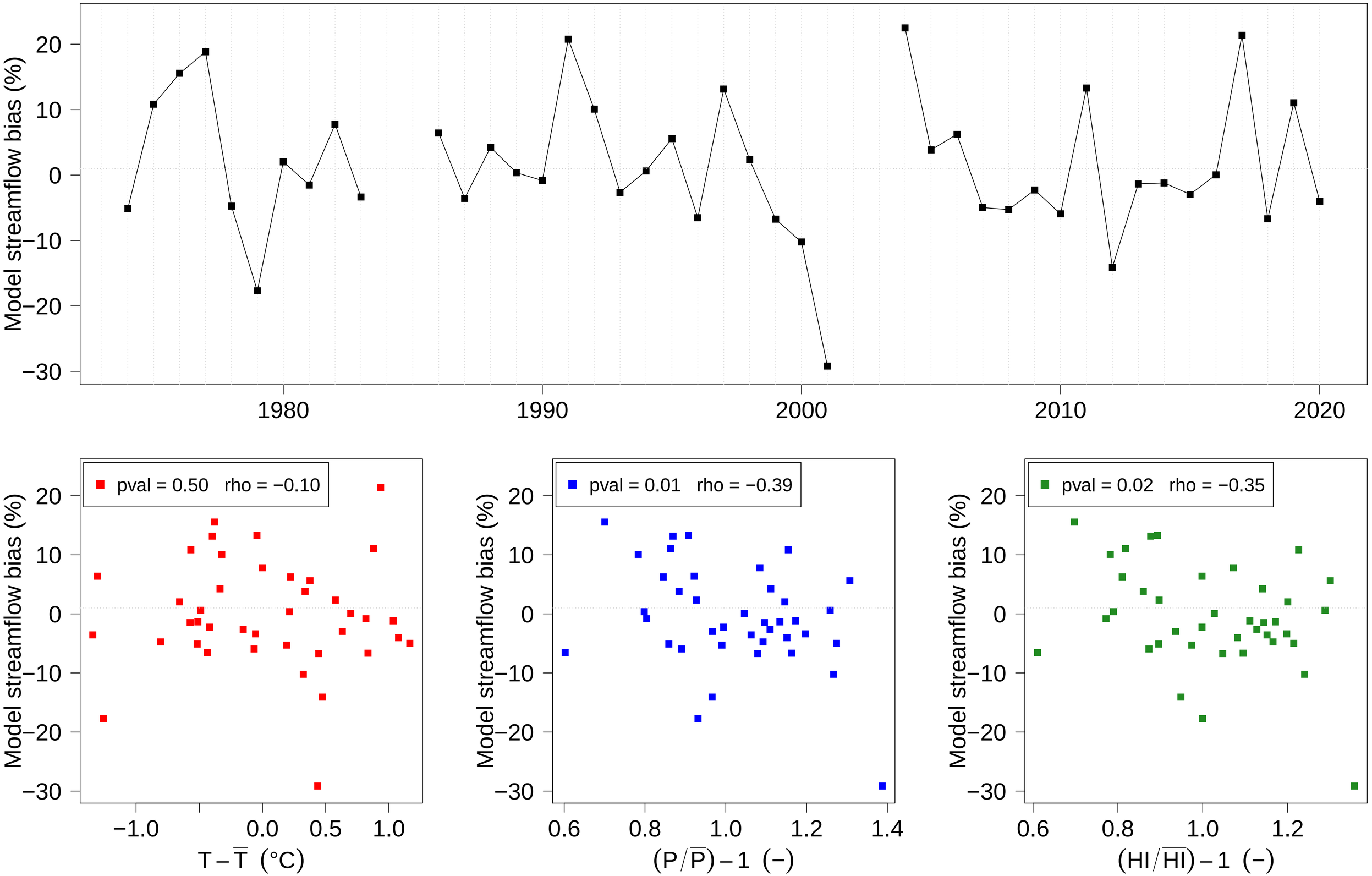
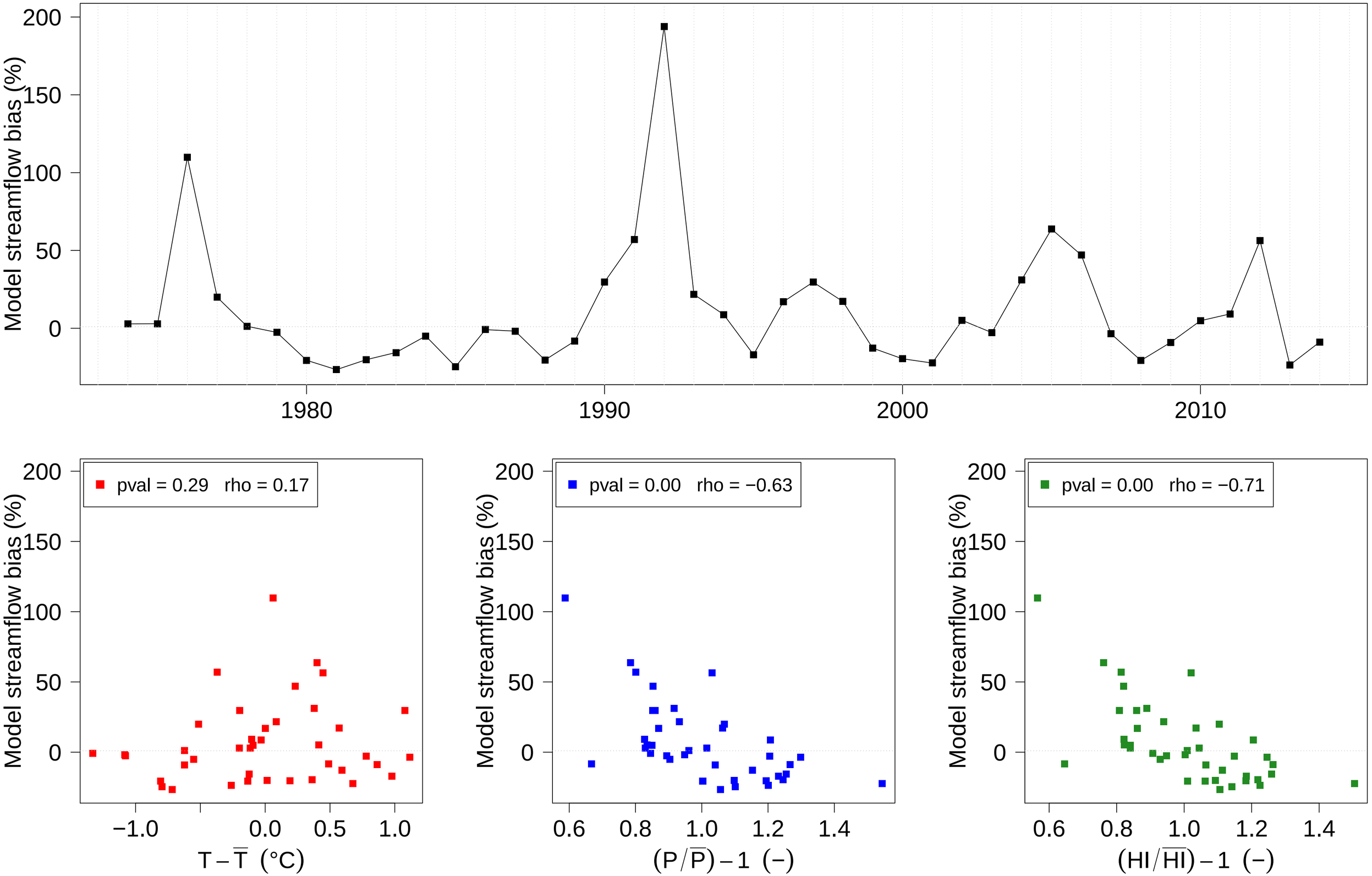


Figure 7. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment I5221010



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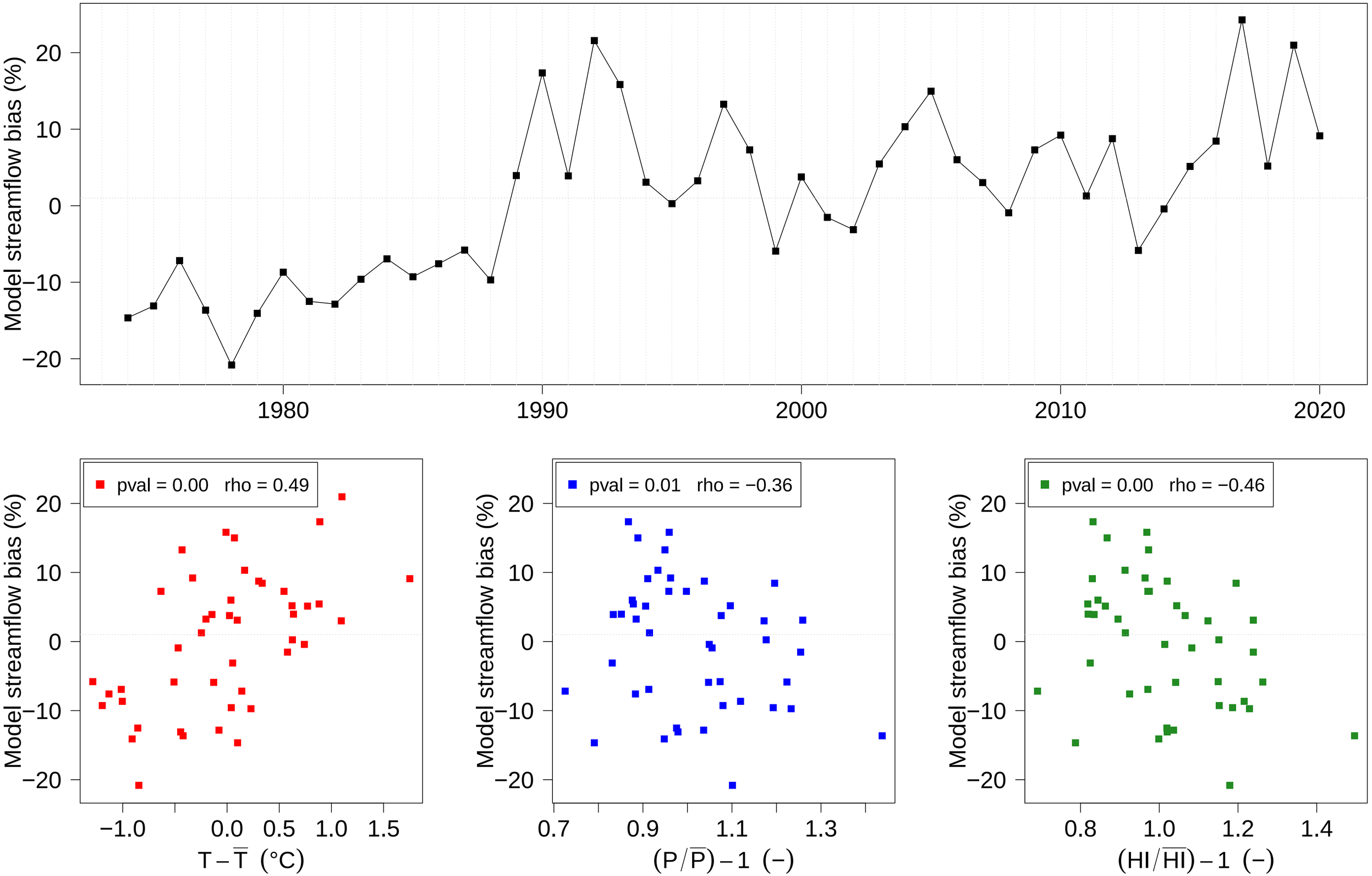


Figure 9. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment K1321810

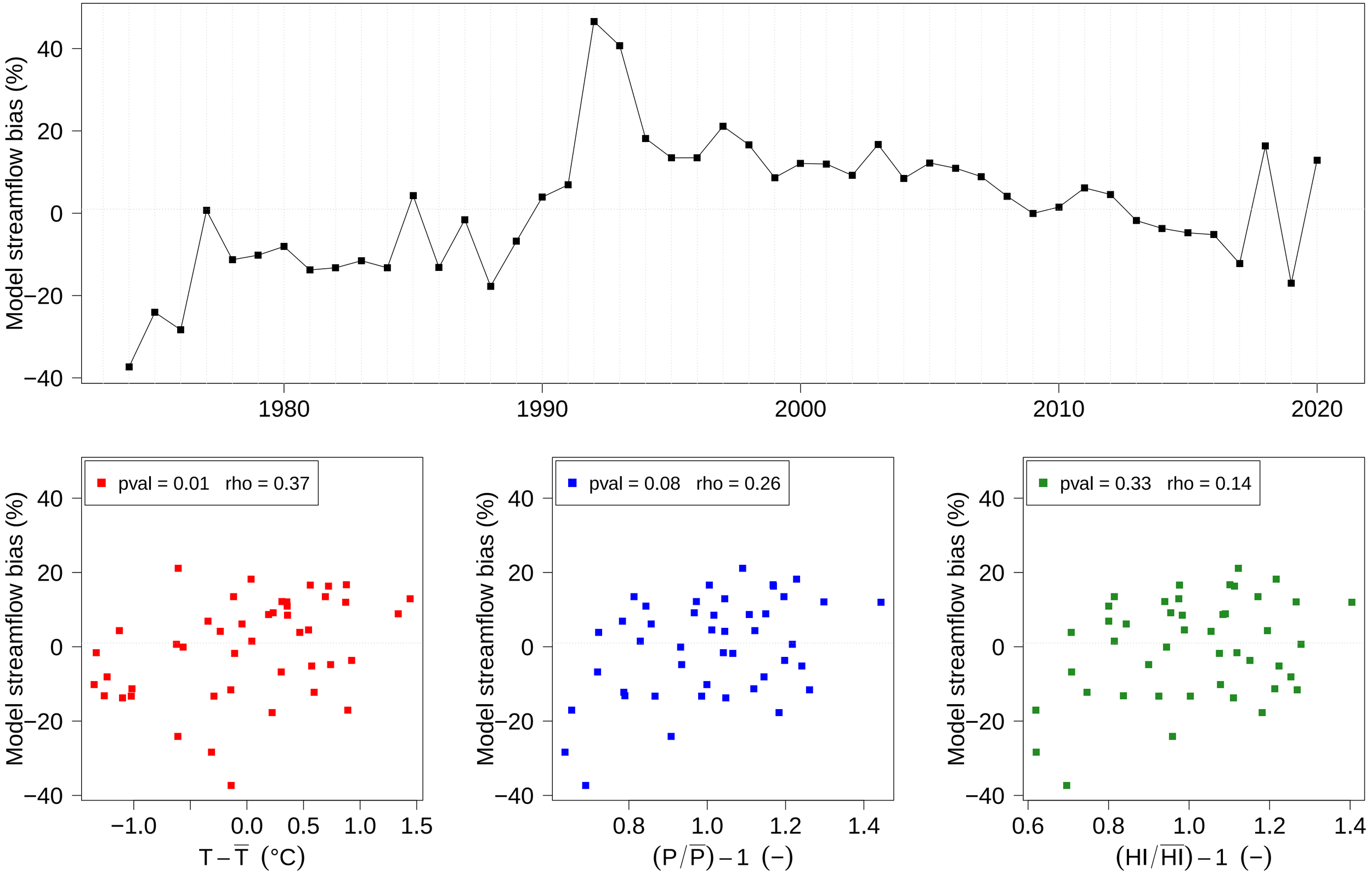


Figure 10. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment K6402520

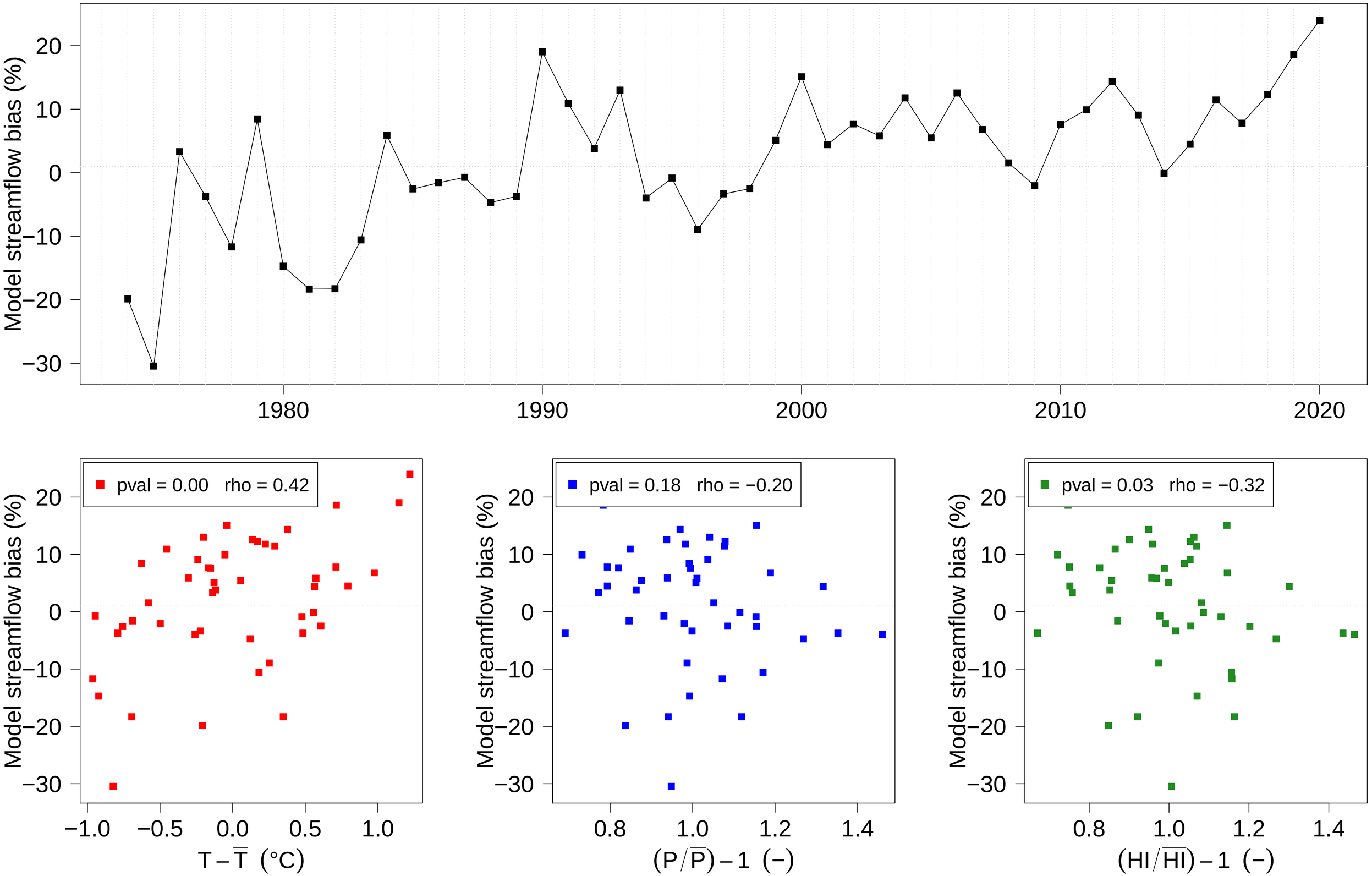
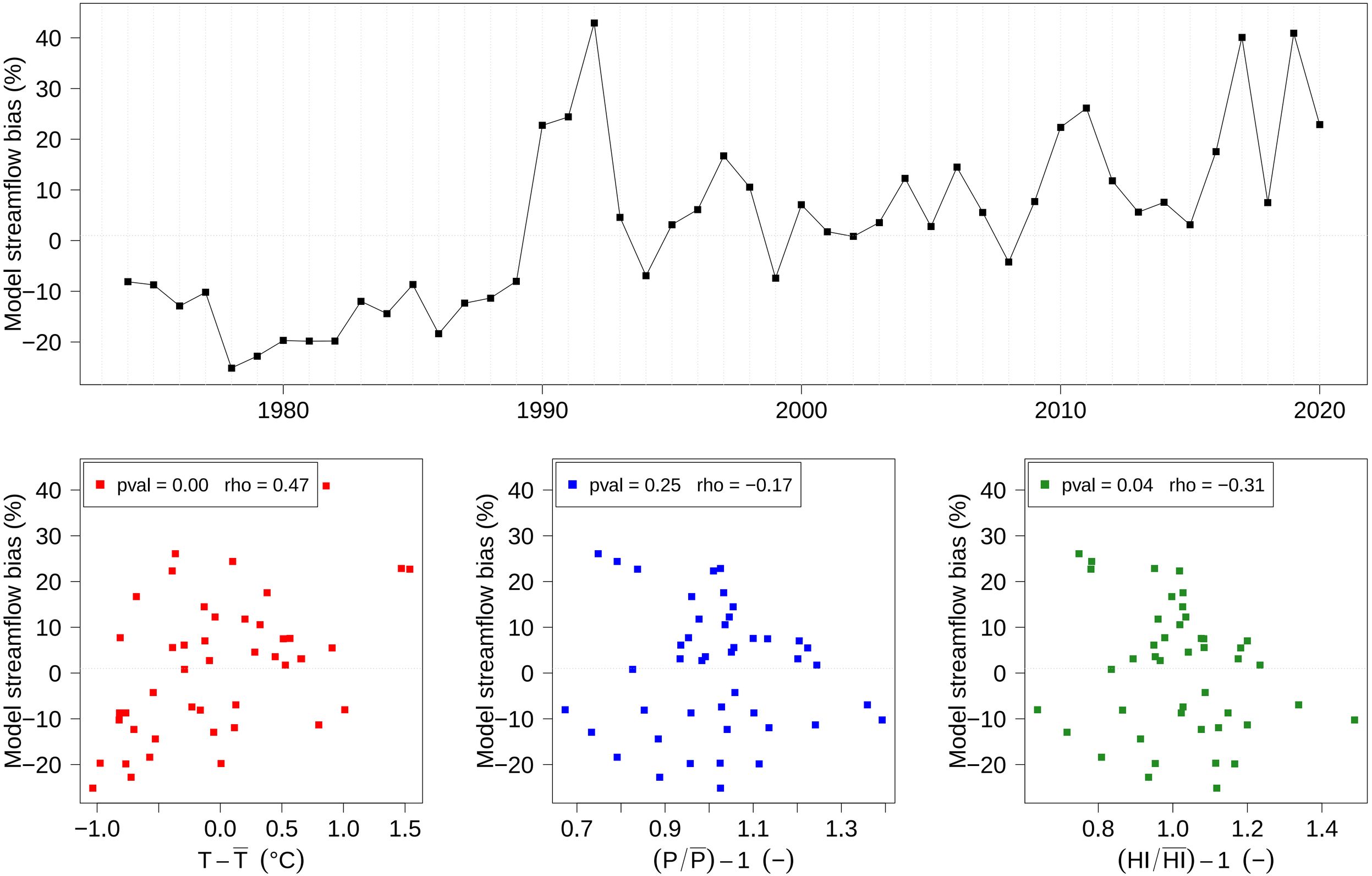


Figure 11. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment L0563010



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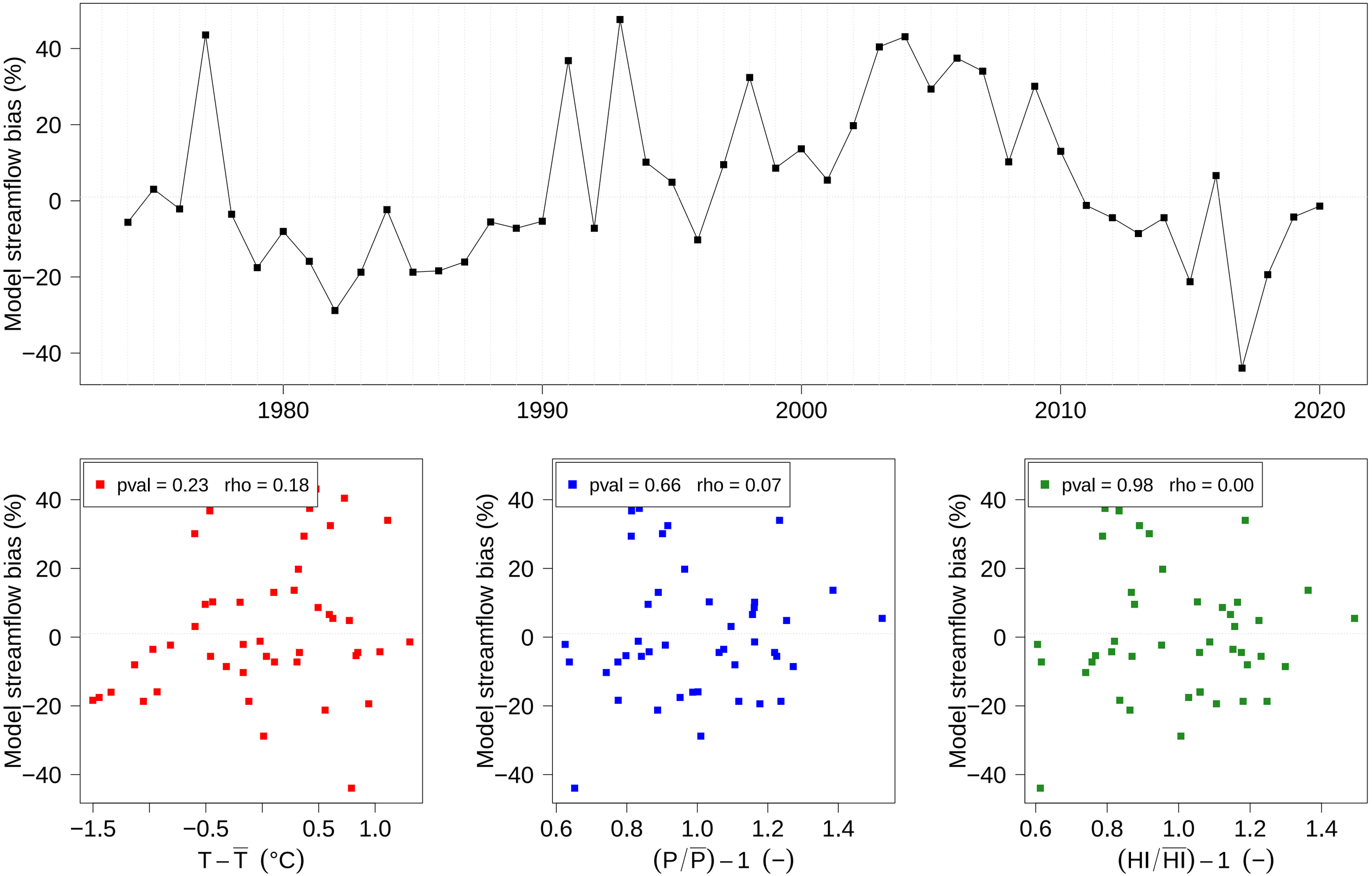

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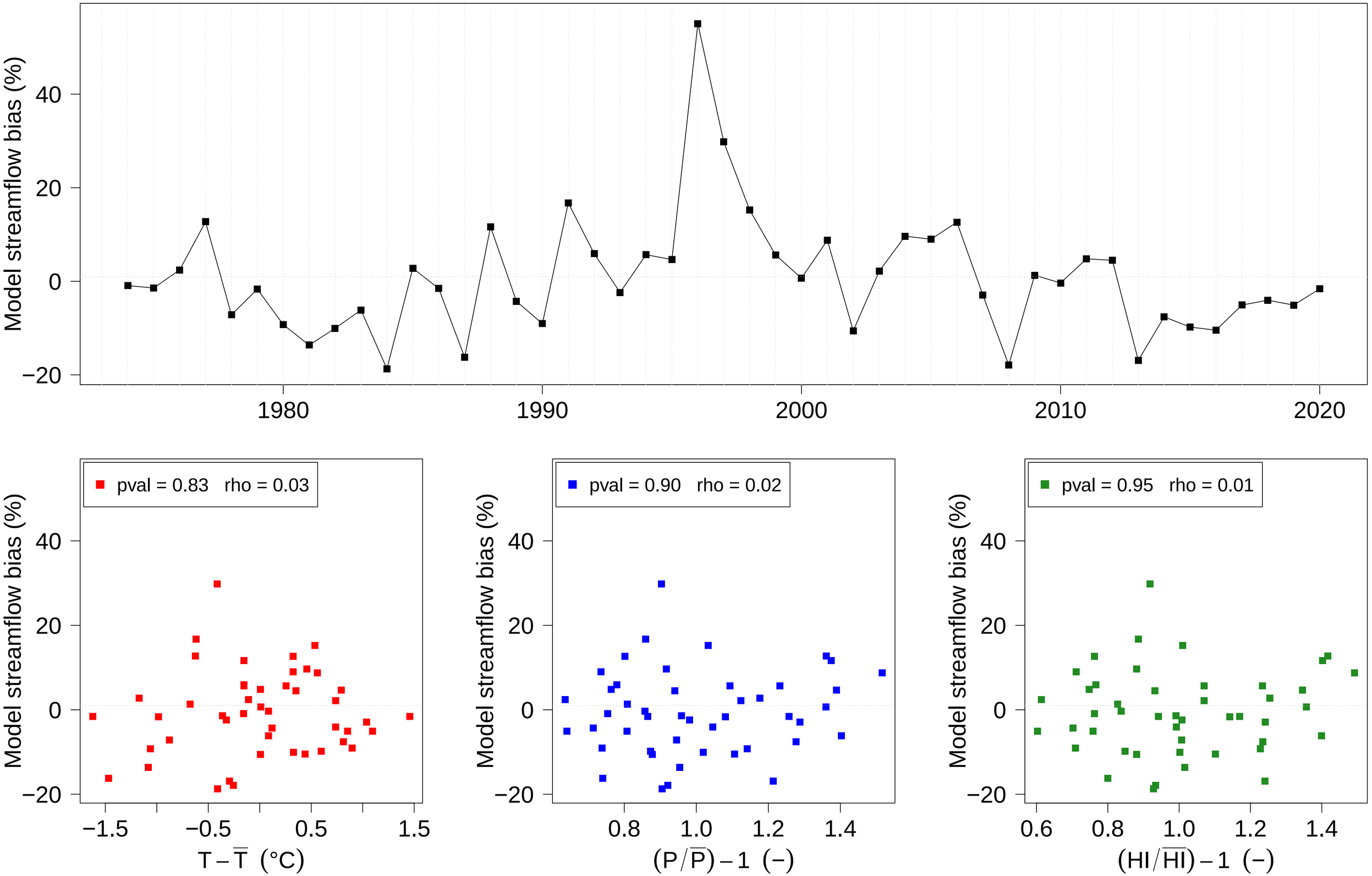
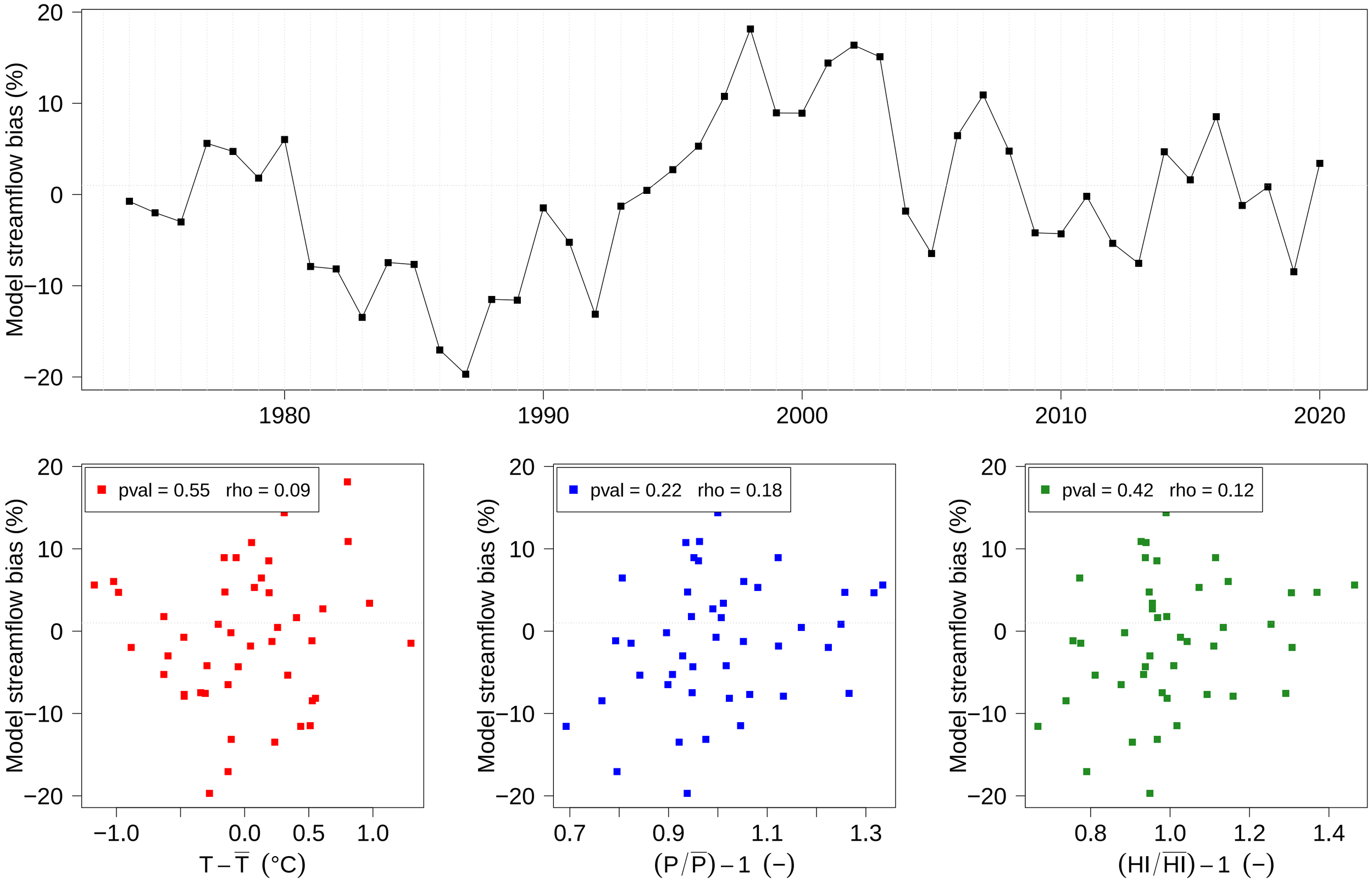


Figure 14. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment M7112410



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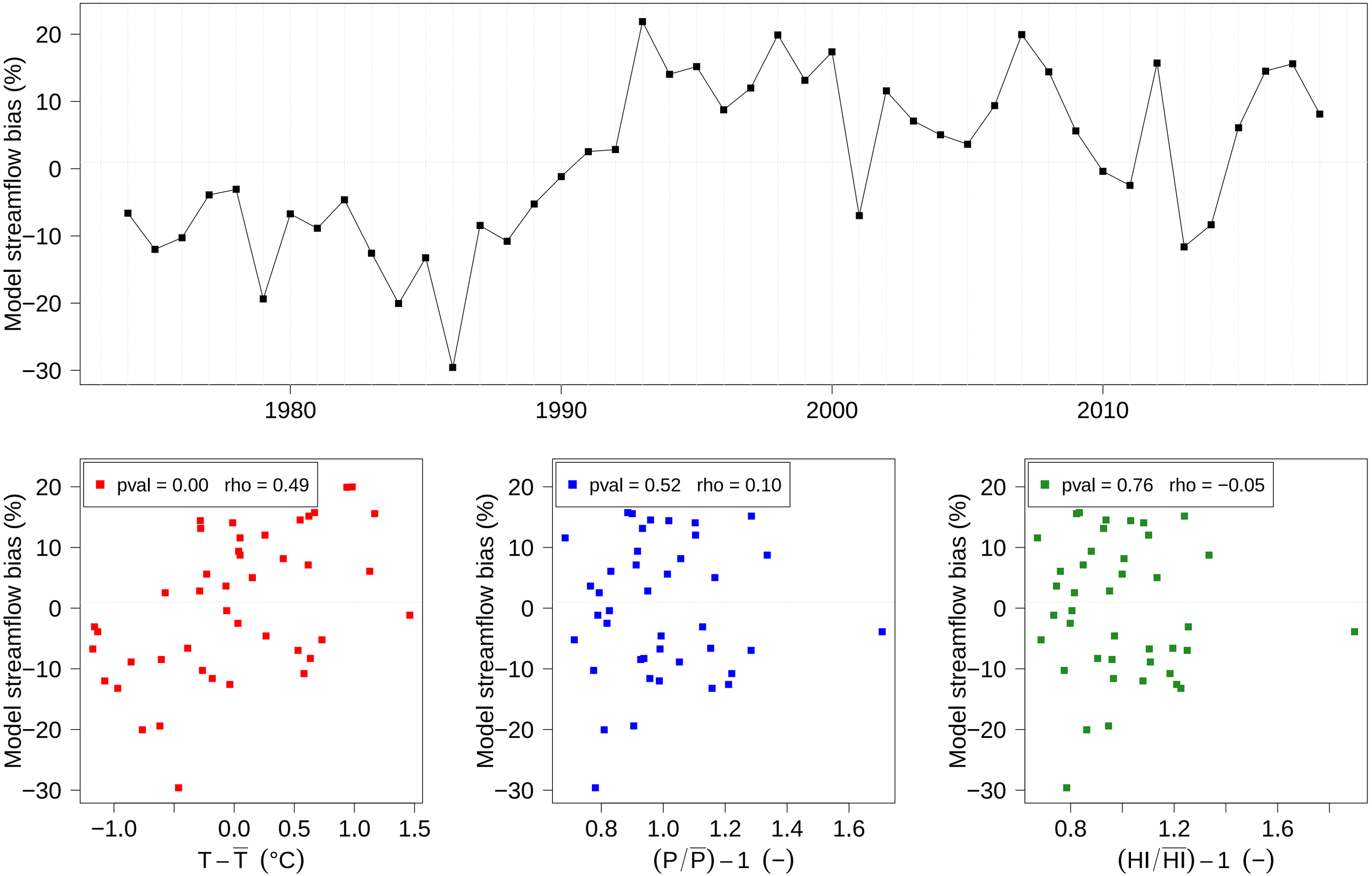

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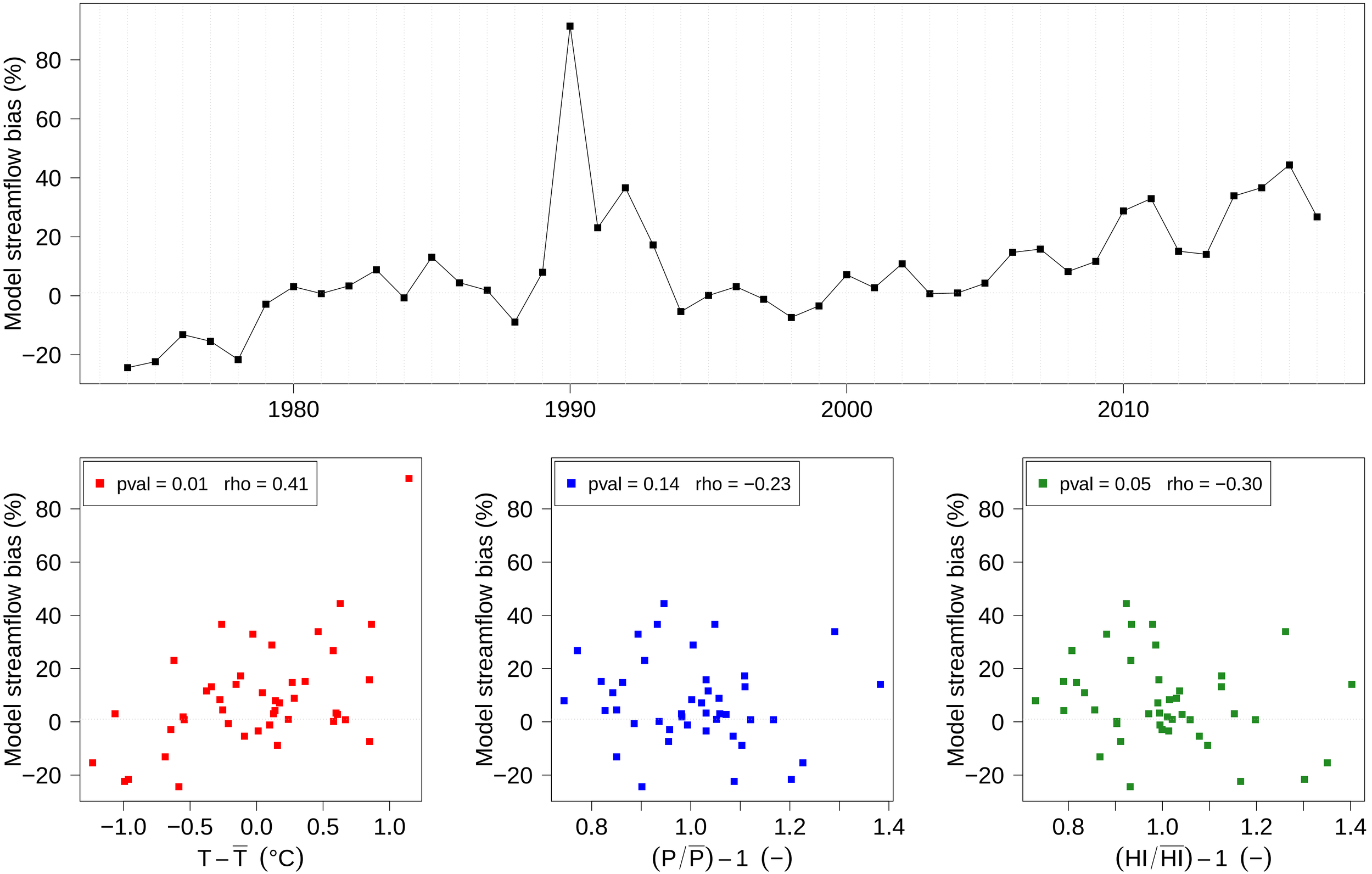

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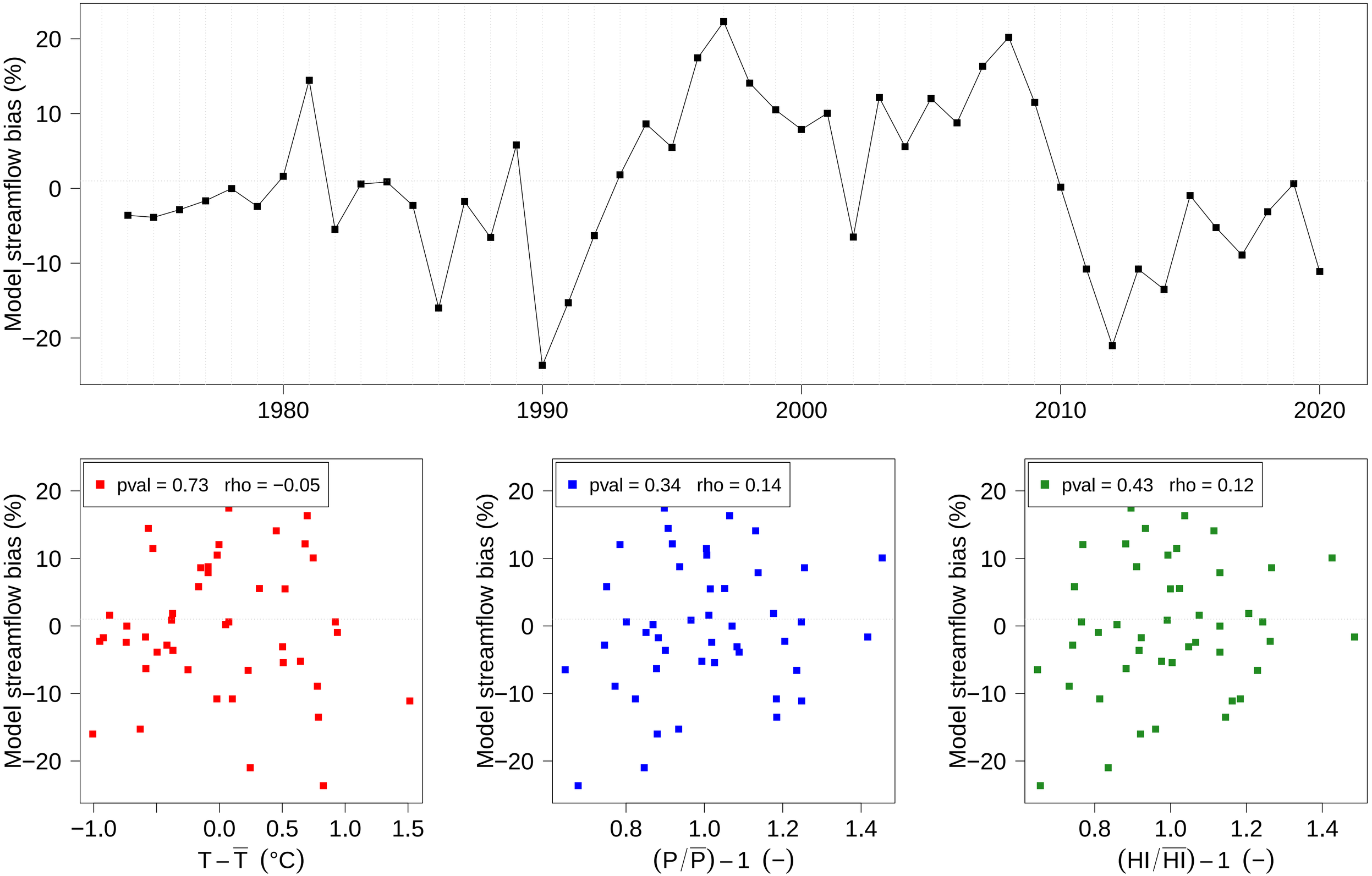

Figure 18. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment S2242510

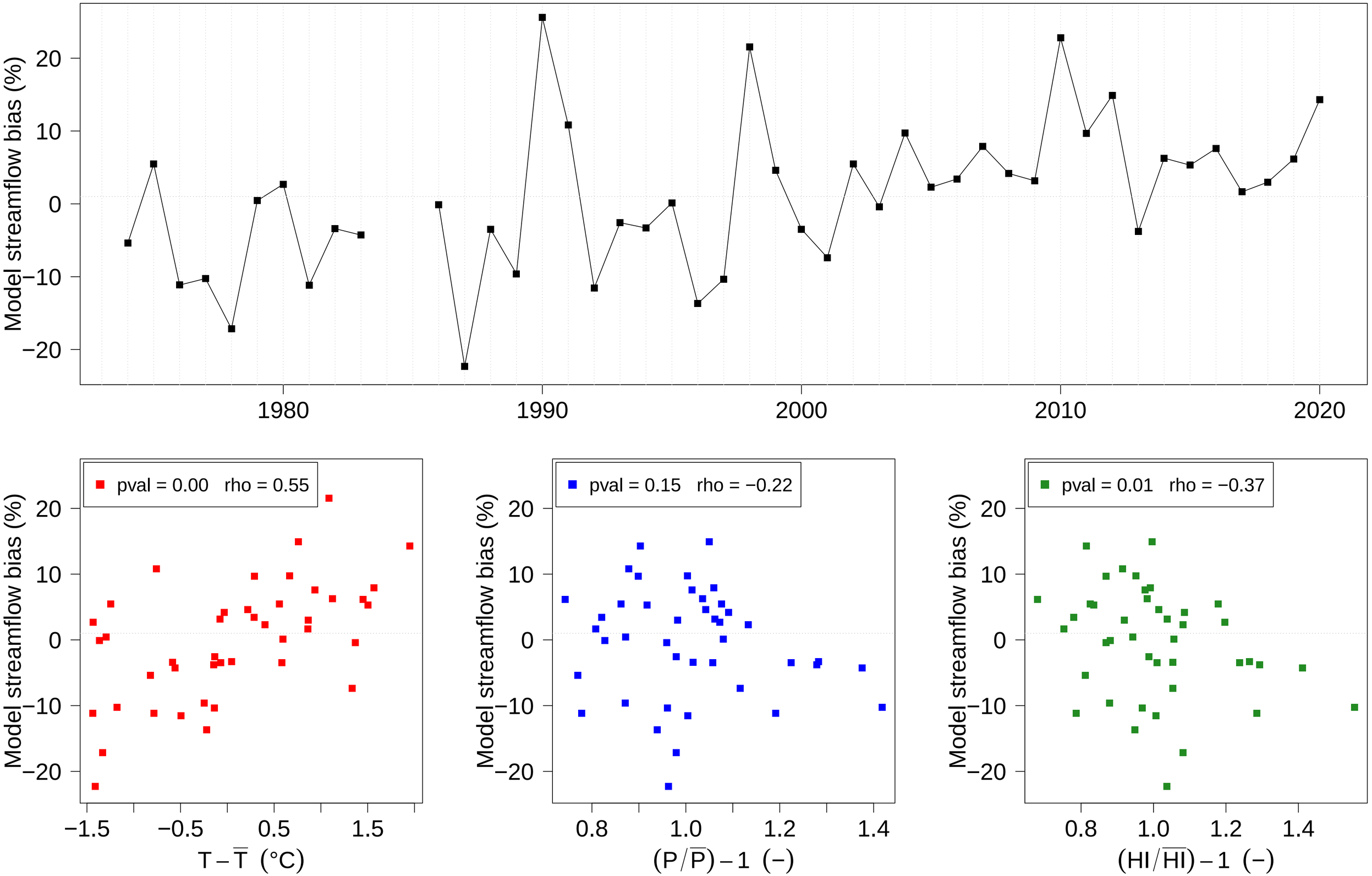

Figure 19. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment U4644010

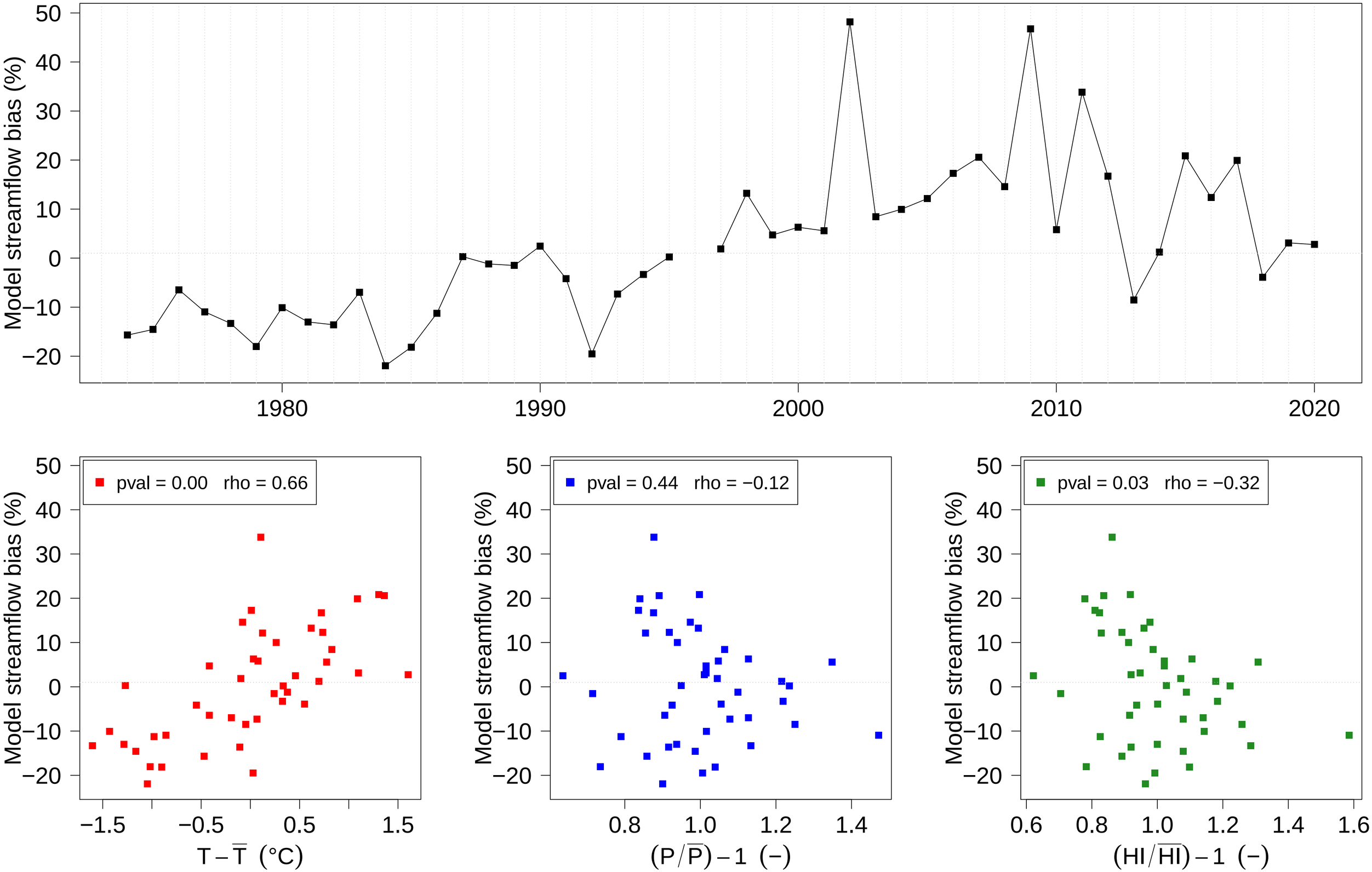

Figure 20. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment V4264010

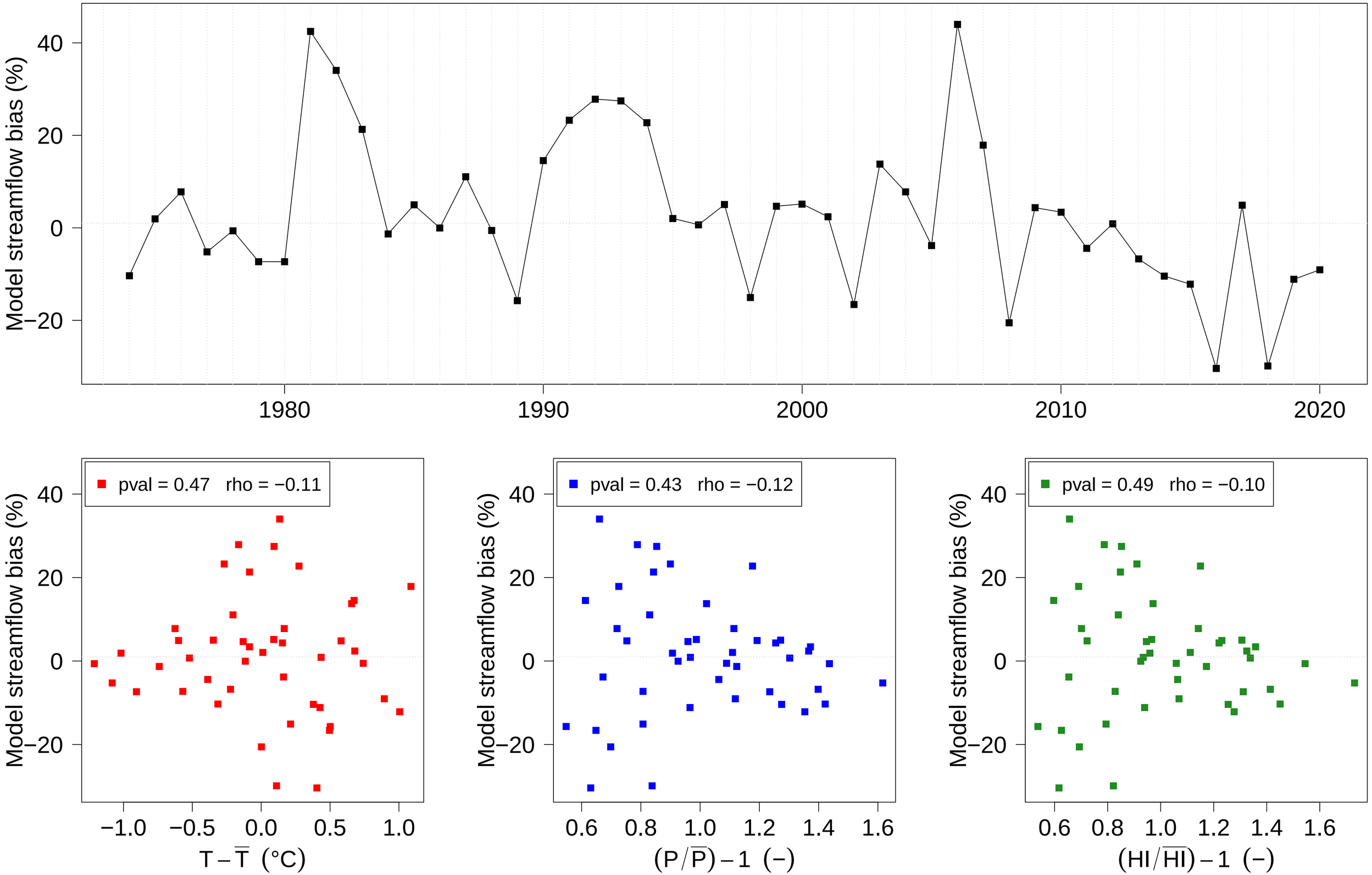

Figure 21. Streamflow annual bias obtained with the RAT function of time (top), temperature absolute anomalies (bottom left) and precipitation P (bottom centre) and humidity index P/E0 (bottom right) anomalies, for the catchment Y4624010