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Atmospheric aridity and apparent soil moisture drought in European forest during heatwaves

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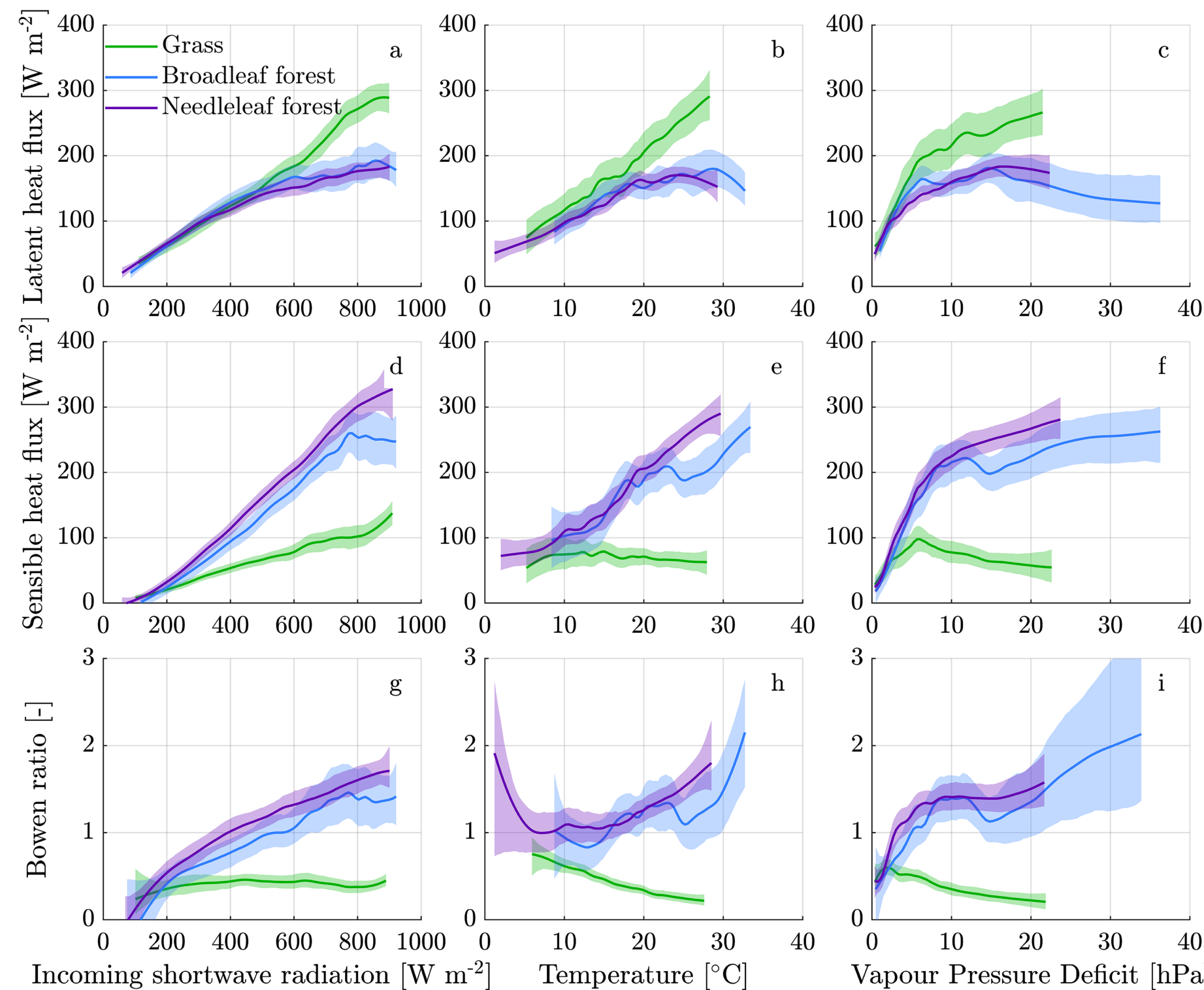


Figure 2. Observed relation between midday atmospheric forcing and latent and sensible heat fluxes. Averages are based on half hourly measurements between 9:00 and 13:00 local standard time. The uncertainty bounds reflect the 2.5th and 97.5th percentiles as determined by LOESS regression on bootstrapped samples. Top panels show the relation between latent heat flux and incoming shortwave radiation (a), temperature (b), and VPD (c), the central panels show the relation between sensible heat flux and incoming short wave radiation (d), temperature (e), and VPD (f), the bottom panels show the relation between Bowen ratio(g), and temperature (h), and VPD (i).

Figure 3. Sensitivity to the VPD response of broadleaf forest. This sensitivity is calculated for a range of relative soil moisture values (varying from wilting point to field capacity, respectively 0 and 1) and a range of early morning temperatures. (a) Temperature of broadleaf forest without VPD response. The white lines represent VPD (hPa). (b) The temperature difference between broadleaf forest with VPD response and without VPD response. The white lines represent the relative increase of VPD (%). (c) The latent heat difference between broadleaf forest with VPD response and without. The difference in sensible heat is represented by the white lines. (d) Apparent soil moisture depletion (SMI), which represents to what extent soil moisture should be reduced to compensate for the VPD response. White lines represent relative apparent soil moisture depletion (%).

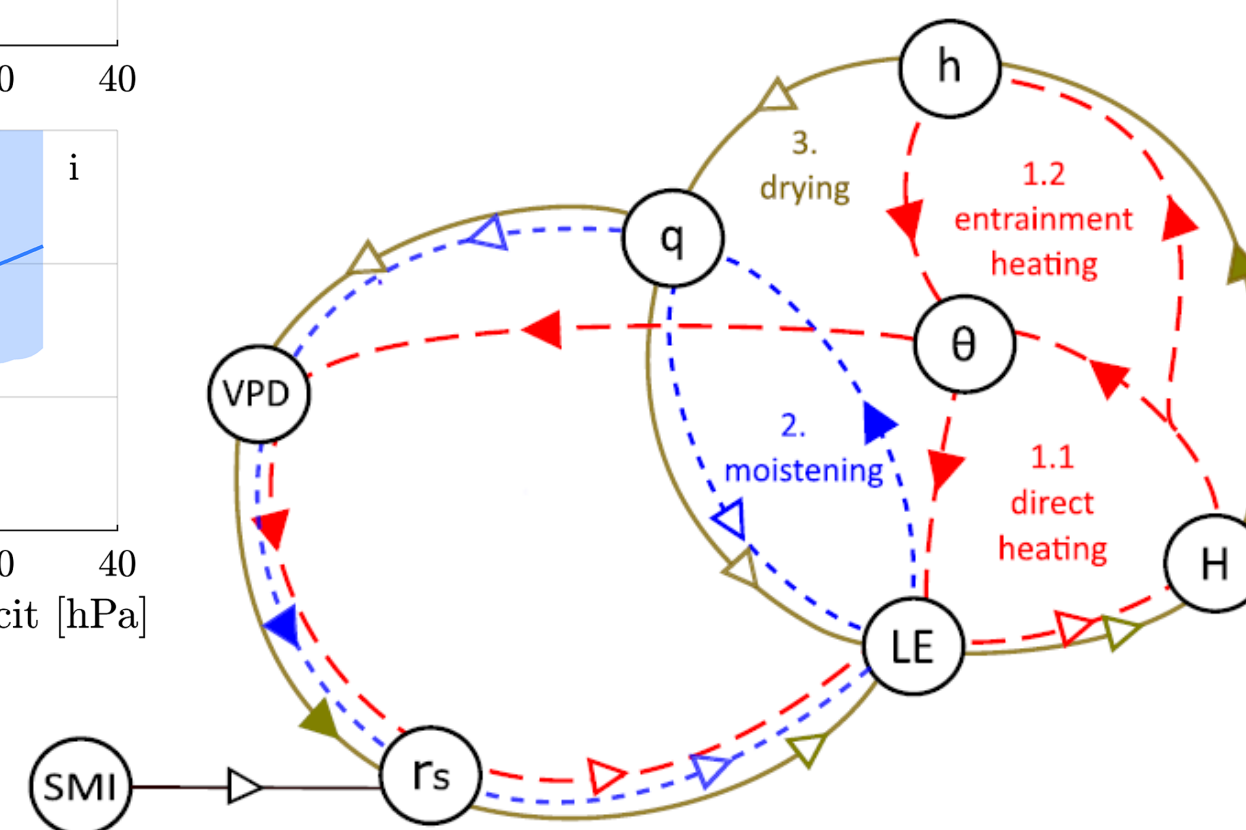
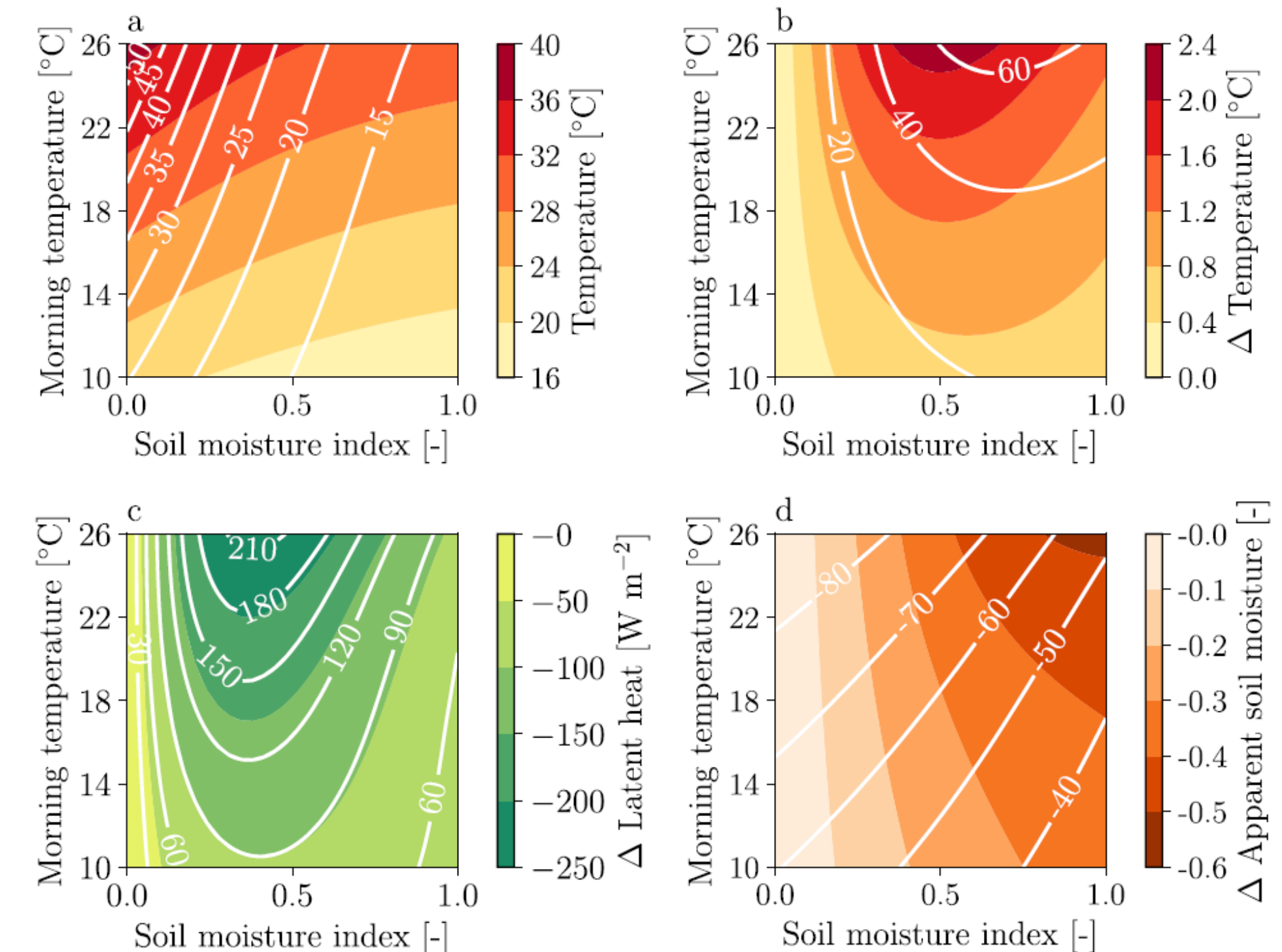


Figure 1. Schematic representation of diurnal feedbacks between the vegetated land surface and the atmospheric boundary layer. Open triangles indicate negative effects, closed triangles positive effects. Each line style/color depicts a distinct feedback loop. LE is the evapotranspiration, H is the sensible heat flux, θ and q are the potential temperature and the specific humidity of the atmospheric boundary layer, h is the height of that layer, r_s is the stomatal resistance, and SMI is the soil moisture index. On the diurnal timescale, it is assumed that SMI changes are small. Figure is based on Van Heerwaarden et al. (2009).

Citation:
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