



The origin of central European prefrontal summer-time convergence lines

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The authors use WRF simulations to investigate the cause of prefrontal, summer-time convergence lines over central Europe. These lines typically form several 100 km east of the cold front in the warm sector of an extratropical cyclone, and they are frequently the focus for convective development. It is shown that these lines are related to a low-level thermal ridge that accompanies the base of the Spanish (or north-African) elevated mixed layer (EML) plume. Using Q-vector diagnostics, including the components normal and tangential to the local isotherms, it is demonstrated that the deformation and rotation of the isotherms at the western periphery of the EML plume lead to a combination of scalar and rotational frontogenesis. The ascending branch of the resulting frontogenetically-forced circulation coincides with the region of low-level convergence. An explanation will also be offered for why these lines generally are summer-time phenomena.