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Conference on European Tornadoes and Severe Storms

The synoptic setting of a thundery low and associated prefrontal squall line in Western Europe

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It is shown that many severe thunderstorms in Western Europe (France, Germany and the Benelux) are in fact prefrontal squall lines linked to the vertical circulation associated with an intensifying cold front and a propagating mid-tropospheric jetstreak. The squall lines are triggered in the updraught of the cross-frontal circulation, which can be observed at the earth's surface as a line of mass convergence or confluence stretching for more than 1000 km from southern Iberia to northern France. The intensification of the front and the destabilization of the atmosphere, in particular over southern France, are interpreted by using the slope of isentropes as indicator of frontal intensity. An equation is derived for the rate of change of frontal intensity, which predicts a forward tilt of the cold front with increasing height due to the cross-frontal circulation in the area of warm air advection (the so-called Spanish plume) and, associated with this, a destabilization of the atmosphere at mid-tropospheric levels.