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How do fronts of differing types arise?

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This study is based on a recently proposed detailed front type classification. In addition to the well-known distinction between warm and cold fronts, this classification also takes into account (a) front intensity, (b) surface fluxes, and (c) intensity of the associated conveyor belts to distinguish between many additional front types. While these additional distinctions appear physically meaningful, the dynamical processes leading to these differences remain unclear.

We investigate the dynamical differences between fronts of different types using dry hydrostatic simulations of the cross-frontal plane. Despite its very idealised character, the model can generate fronts covering all types of the proposed front type classification. We achieve this variety by adjusting the initial surface pressure distribution, the initial vertical stability, the basic-state vertical shear, and the surface sensible heat flux. We analyse the differences in the dynamical evolution leading to frontal collapse between fronts of differing types, comparing amongst others the cross-frontal Sawyer-Eliassen circulation.