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# Frontal Life Cycles – Detection and Climatology

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The release of latent heat on the warm side of trailing cold fronts can leave elevated levels of baroclinicity. This can lead to one or multiple secondary cyclones forming in the wake of the parent cyclone, intensifying moisture advection and latent heating. Although this mechanism has been demonstrated in case studies, we still lack a consistent global mapping of the evolution of fronts and associated diabatic processes. We develop a novel algorithm to both detect fronts in global weather and climate datasets and track them in time. We utilise a watershed algorithm to identify individual fronts as volumes in the four-dimensional domain of space and time. We apply this algorithm to equivalent potential-temperature fields from the ERA5 reanalysis on three pressure levels in the lower to middle troposphere to compile a global climatology of frontal lifecycles. We then categorise these lifecycles with respect to their characteristics as well as dynamic and thermodynamic properties. Furthermore, the intensification mechanisms are explored, in particular with respect to latent heating.