Resolved and parametrised energy cascades in the IFS

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Spectral energy budgets following the method proposed by Augier and Lindborg (2013) have been used to illustrate how physical parametrisations influence the energy spectra and the non-linear energy transfer across scales in the IFS.

Simulations with increasing complexity show that the surface drag and the vertical subgrid mixing of momentum in the boundary layer have a strong control on the non-linear energy transfers of both kinetic energy and available potential energy and that they influence the shape of the energy spectra.

Spectral analyses of the tendencies issued from the parametrisations show that the physical parametrisations act at all scales. Simulations with explicit convection also suggest that the convection parametrisation disable natural energy transfers across scales and replace them by direct and adjustable forcing at all scales. By comparing the spectral diagnostics for model simulations with different complexity and by comparing different modelling choices, an attempt is made to assess model error behaviour.

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