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Development of very high resolution models for local fog prediction

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The presence in the lower atmosphere of fog can be highly hazardous for both aviation and road transport. High quality predictions of the formation and dissipation of fog, together with associated changes to visibility, are therefore of vital importance. However numerical fog forecasting remains a notoriously difficult problem.

The formation of fog depends on complex and highly non-linear interactions between surface and sub-surface processes, atmospheric radiation, atmospheric turbulence, flows induced by local orography and cloud microphysical processes. The dissipation of fog also involves the complex dynamics generated internally by the fog.

Current operational mesoscale models can give a broad indication of fog formation and dissipation on scales of a few tens of km, but - due to both the grid resolution and the general nature of the physics parametrisations - provide little detail and remain unreliable, especially in areas of complex terrain. We have run several radiation fog case studies with a very high resolution (1km horizontal grid) limited area configuration of the Met Office Unified Model. Using both this and a single column version of the same model, we also investigate uncertainties in the model physics package, with the goal of improving the predictability of local radiation fog. In particular we examine the representation of the long-wave radiative flux divergence in the lowest layers of the atmosphere.