Return to isotropy in atmospheric turbulence

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An initially anisotropic but homogeneous turbulent flow created by the mean flow gradients relaxes to an isotropic flow upon removal of the mean velocity gradients. In second-order linear closure models of turbulence, third-order moment terms appearing in the transport equations for second-order moments such as momentum fluxes are modelled based on this return-to- isotropy behaviour of turbulence. Such linear models however fail when the initial flow that goes through relaxation is strongly anisotropic. The need for a nonlinear representation of slow pressure-strain correlation arises for such flows. In our work presented here we analyse the return-to-isotropy behaviour of flows above the canopy in forests of Hyytiälä. We observe that as the surface conditions and atmospheric stratification changes due to seasonal and diurnal cycle the relaxation process towards the isotropic state varies across large to small scales.