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Turbulent intermittent structure in non-homogeneous non-local flows

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Data from SABLES98 experimental campaign have been used in order to study the influence of stability (from weak to strong stratification) on intermittency [1]. Standard instrumentation, 14 thermocouples and 3 sonic anemometers at three levels (5.8, 13.5 and 32 m) were available in September 1998 and calculations are done in order to evaluate structure functions and the scale to scale characteristics. Using BDF
[2-4] as well as other models of cascades, the spectral equilibrium values were used to calculate fluxes of momentum and heat as well as non-homogeneous models and the turbulent mixing produced. The differences in structure and higher order moments between stable, convective and neutral turbulence were used to identify differences in turbulent intermittent mixing and velocity PDF's. The intermittency of atmospheric turbulence in strongly stable situations affected by buoyancy and internal waves are seen to modify the structure functions
exponents and intermittency, depending on the modulus of the Richardson's number,Ri, as well as of the Monin-Obukhov and
Ozmidov lengthscales. The topological aspects of the turbulence affected by stratification reduce the vertical length-scales to a maximum described by the Thorpe and the Ozmidov lenth-scales, but intermittency, Kurtosis and other higher order descriptors of the turbulence based on spectral wavelet analysis are also affected in a
complex way [5,6]. The relationship between stratification, intermittency, μ(Ri) and the fractal dimension of the stable flows and between the dispersion, the fractal dimension are discussed. The data analyzed is from the campaign SABLES-98 at the north-west Iberian Peninsula plateau.(Cuxart et al. 2000). Conditional statistics of the relationship between μ(Ri) are confirmed as in (Vindel et al 2008)[4] and compared with laboratory experiments and with 2D-3D aspects of the turbulence cascade. The use of BDF [3] model comparing the corresponding relative scaling exponents which are estimated from two characteristic parameters(D,b). For unstable or neutral situations, it is possible to find values for these parameters that represent the empirical scaling exponents D and b obtained from [1]. When D increases, the order smaller than 3 relative scaling exponents also increases (but for orders higher than 3, they decrease) linearly. On the contrary, for a certain value of D, when b increases the behavior of the relative scaling exponents is the opposite and non-linear.

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