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I) **Brownian motion and first encounter with stochastic processes**

The phenomenon of Brownian motion will be reviewed starting from empirical observation and providing the theory by Einstein, Smoluchowski and Langevin. Random walk models will be introduced. Physical insights will be given on the role of stochastic modelling.

II) **Stochastic differential equations as efficient models**

We briefly introduce continuous stochastic process, including Chapman-Kolmogorov and Fokker-Planck equations, then analyze SDEs and notably the Ornstein-Uhlenbeck process. Then, we present some interesting stochastic models for physical problems: (i) A simple model for climate, the Benzi-Parisi-Sutera-Vulpiani stochastic resonance; (ii) Langevin model of turbulence.
At the end, some discussion on the stochastic modelling approach and its link with coarse-graining will be given.

III) **Intermittency in turbulence**

The problem of fluctuations in Fluid Turbulence will be described. Then, multifractal models of it will be analysed, including Kolmogorov-Obukhov log-normal one. Large deviations in probability will be then introduced and its link with multifractal models explained.

IV) **Recent results and perspectives**

In this last lecture, we will give an overview of some recent application of stochastic processed to fluid phenomena, and specifically to turbulent multiphase flows. Both particle-laden and interfacial flows will be discussed, moderately dense suspensions and droplet fragmentation in turbulent emulsions. If time is available, some perspectives in geophysical flows will be considered.