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Spectral description of migrating bedforms and sediment transport MICHELE GUALA, NICHOLAS BADHEARTBULL, ARVIND SINGH, EFI FOUFOULA-GEORGIOU, St Anthony Falls Laboratory, Dep. Civil Engineering, NCED, UMN — The spatio-temporal evolution of migrating bedforms in an experimental straight flume with erodible bottom and fixed side-banks is presented through a joint spectral analysis of surface elevations in the frequency and wave number domains. In this framework any generic bedform can be described as a combination of Fourier modes propagating with well defined, scale-dependent, convection velocities. Quasi-simultaneous measurement of bed elevations $z=f(x,t)$ in time (t) and space (x , along the flow direction) are used to estimate the propagation velocity of each Fourier mode, and to propose a purely statistical, spectral approach to quantify sediment transport rates in the presence of bedforms. A functional relationship between the length scale and time scale of migrating bedforms is developed into a dimensionless expression for scale-dependent convection velocities. The latter is further used to provide an estimate of sediment transport rate in the presence of generic migrating bedforms. Experiments were conducted in the Tilting Bed Flume at SAFL under varying flow and bed material conditions.

Michele Guala
St Anthony Falls Laboratory, Dep. Civil Engineering, NCED, UMN

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