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Spectral behavior of sand bed rivers at small wavelengths

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ABSTRACT

The '-3' scaling law of sand waves has often been verified in studies dealing with statistical properties of sand beds. Most of the data used for this verification were measured in laboratory studies in which it is possible to reach equilibrium conditions. Large scale rivers, on the other hand, are rarely characterized by steady flow conditions which means that true equilibrium conditions are special cases and a deviation from the '-3' scaling law may therefore be expected. This issue is investigated in the present study by the analysis of the spectral behavior of river bed surfaces of the Elbe River in Germany. The emphasis of the study is placed on the spectral behavior at small wavelengths. The results show that the spectral behavior at small wavelengths deviates from the '-3' scaling law and that this spectral region can be characterized by steeper slopes. The relationship between the spectral characteristics at small wavelengths and flow discharge is subsequently analyzed. The overall results support the hypothesis that the development of secondary dunes affects the spectral behavior at small wavelengths.