

Alluvial cover and bedrock channel sinuosity

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The mechanisms by which bedrock channels actively meander have been debated since the beginning of modern geomorphic research in the 19th century, but a final consensus has not been reached. Remote sensing studies of the Pacific Arc islands show that regional channel sinuosity scales with erodibility of the substrate and storm frequency. However, no mechanisms are known that effectively reduce sinuosity and keep it at a constant value, and the field observations as yet wait for a coherent theoretical explanation. It has long been argued that whether a bedrock channel meanders actively or not is determined by the availability of sediment relative to transport capacity, a notion that has also been demonstrated in laboratory experiments. Here, this idea is taken up by postulating that the rate of change of sinuosity over time is dependent on bed cover only. It is shown that a simple model based on sediment-flux driven bedrock erosion can explain why sinuosity evolves to a steady state value and predict the observed relations between sinuosity, erodibility and the variability of precipitation.