

DISCUSSION ON PAPER 8674

Meandering and braiding of alluvial channels

R. Bettess and W. R. White

Mr J. Stebbings

In studying the difference between meandering and braided channels, the Authors correctly state that braided channels are steeper than those which only meander. The writer believes that this greater slope is due to excessive bed-load, and that the amount of bed-load will determine whether a channel becomes relatively stable in either the braided or the meandering condition.

40. Tests with model channels were reported in an earlier paper.²⁴ Fig. 6 (taken from that paper) shows the onset of meandering. After a certain value of bed-load had been reached, the phenomenon of 'the alternate deeps and shoals' became evident. This caused the thalweg to become sinusoidal leading to erosion first on one bank and then, immediately downstream, on the other.

41. However, with still increasing bed-load, an advancing shoal moved faster (Fig. 7) than one downstream of it, causing a tongue of material to be deposited in mid-stream. This led to bank erosion at points opposite one another, with a consequent splitting of the channel and a formation of islands as the separate channels became deeper leaving the centre shoals above the surface.

42. It would be interesting to know whether this phenomenon has been observed in the field. However, this would be difficult at the time of high flows; and probably the tail of the hydrograph would at least partially obliterate the bed formation. This was also demonstrated in the experiments when, at the cessation of bed-load, a braided channel reverted to a straight one, with the original cross-section along the whole of its length.

Dr Bettess and Dr White

43. The Authors would like to thank the discussor for drawing their attention to his interesting experimental work, which bears certain similarities to the experiments described in the Authors' paper. As Mr Stebbings rightly declares, his observation that a laboratory channel passed from being straight to meandered and then braided, as the sediment load was increased, supports the framework proposed by the Authors. This follows, as an increase in sediment load will increase the equilibrium slope required by the channel system, while the valley slope, represented by the slope of the flume, remains fixed. Thus as the sediment load increases the ratio S/S_c increases, leading first to a meandering channel and then to a braided channel. The Authors would suggest, however, that whether a channel will have a straight, meandered or braided form does not depend only upon the value of the sediment load, but upon the equilibrium slope for a given

DISCUSSION

discharge, sediment load and sediment size and the imposed valley slope. We therefore believe that altering the sediment load while keeping the other variables fixed may alter the form of the channel, but changes in the other significant variables may also have an effect on the channel pattern displayed.

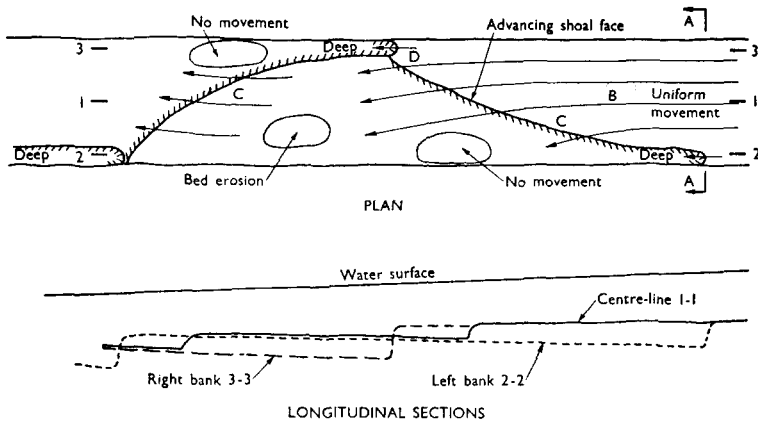


Fig. 6. Alternate deeps and shoals in parallel-sided channel

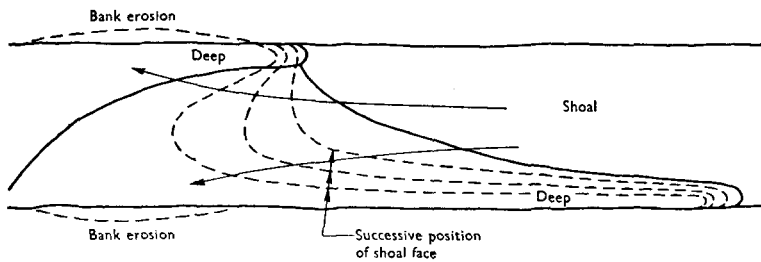


Fig. 7. The 'Overtaking' shoal

References

24. STEBBINGS J. The shapes of self-formed alluvial channels. *Proc. Instn Civ. Engrs*, 1963, **25**, Aug., 485-510.