Geological Society of America - Cordilleran Section Meeting (Portland, OR)
1996 Abstracts with Programs v. 28, p. 57

Mechanism and Timing of Emplacement of Clastic Dikes in the Touchet Beds of the Walla Walla Valley, South-central Washington

Cooley, S.W.; Pidduck, B.K.; Pogue, K.R.
Whitman College, Department of Geology

In south-central Washington, rhythmically-bedded slackwater deposits of the late Pleistocene Missoula floods (the Touchet Beds) contain ubiquitous sheeted clastic dikes. At present, there is no consensus on timing or mechanism of emplacement of these dikes. Previous workers have proposed theories relating the dikes to ice wedges, earthquakes, dessication, and loading by flood waters. To evaluate these hypotheses, most of the largest outcrops of Touchet Beds in the Walla Walla Valley were examined with regard to geometry of individual dikes, the number of dikes per meter, maximum dike thickness, and cumulative dike thickness. In addition, values were assigned to each outcrop based on the relative development of rhythmites and faulting. These parameters were compared with each other and with geographic factors including outcrop elevation and location relative to the basin margin. Analysis of the relationship between the various parameters strongly suggests that an earthquake or a series of earthquakes near the end of the cycle of Missoula floods was responsible for the emplacement of the vast majority of the clastic dikes. Gravity-driven lateral spreading of semi-consolidated Touchet Beds resulted in ground cracking and slumping that was concurrent with the downward injection of saturated sediment. Lateral spreading and dike emplacement were more intense along the gently-sloped northern margin of the basin which was inherently less stable that the relatively flat interior. The cracks gradually widened and the dikes developed their sheeted structure as the infiltration of water promoted intervals of slumping and infilling.