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Title: ADP-simulated flow velocity and its hydromorphological implications in China's 3-Gorges Valley: Present and Perspective

Abstract:

In May and June 2002, ADP (Acoustic Doppler Current Profile SONTEK) was mounted on boat and guided with GPS to survey the 3-Gorges valley which is 650 km long in the upper Yangtze catchment. Data obtained when survey was accompanied with discharge of 15000 m³/s in the valley and characterized distribution of flow velocity and river bed morphology. It is noted that the flow velocity above WAN-XIAN (mid-Gorges) coincides with river width, ranging generally from 1.0-3.0 m/s and the maximum velocity (3.0-4.0 m/s) occurs in the surface and mid layers of water depth. In contrast, the velocity from WAN-XIAN downstream to LI-DU keeps in agreement with water depth, where the flow velocity is usually greater than that of above WAN-XIAN valley, ranging from 2.0-4.0 m/s. Furthermore, maximum flow velocity tested as up to 4.0-7.5 m/s occurs in the narrow 3-Gorges valley. Survey also detected a slow flow velocity (mostly <1.0 m/s) in a river channel of about 100 km long from Ge-Zhou-Dam (completed at the end of 1970s and ~20 km to 3-Gorges Dam site) upward extended. Accordingly, siltation behind the Ge-Zhou-Dam can be about 20 m higher than the former river bed and 20 km extension upward from the dam. Our preliminary estimation of the present study proposes a bulk volume of sediment of 430 million tons accumulated in the reservoir over the past 30 years. 3-Gorges Dam will be completed in 2009, and water level will be elevated to 135-175 m above mean sea level during the different seasons. On the basis of present investigation, it is assumed that the flow velocity in the valley will be reduced largely and even <1.0 m/s within the entire valley, especially during the non-flood season. This would promote a large quantity of sediment being silted behind dam, taking into account the present sediment flux of about 5-6 × 10⁸ t/a transported into the valley from the upper sources area. It is therefore, an urgent task for scientists to further monitor the relationship among fluvial variables like the present mismatch during and after the completion of the Damming.

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