



Reanalysis of the 19th Century hydrology and sediment load dataset for the Irrawaddy River, Myanmar

R.A.J. Robinson (1), M.I. Bird (1), N.W Oo (2), X.X. Lu (3), T.B. Hoey (4), A. Swe (5), and T. Tun (6)

(1) School of Geography and Geosciences, University of St Andrews, St Andrews, Fife KY16 9AL, Scotland, UK (rajr@st-andrews.ac.uk) (2) Department of Geography, Yangon University of Distance Education, Yangon, Myanmar, (3) Department of Geography, National University of Singapore, Singapore 119260, (4) Department of Geographical and Earth Sciences, University of Glasgow, Glasgow, G12 8QQ, UK, (5) Yangon University, Yangon, Myanmar, and (6) Mawlamyine University, Mawlamyine, Myanmar.

The Eastern Himalayas/Tibetan Plateau are drained by six major river systems and two of these, the Ganges/Brahmaputra (G/B) and the Irrawaddy/Salween (I/S) debouch into the eastern Indian Ocean. These two systems are thought to deliver close to half of the current flux of water, sediment and dissolved load from the Himalayas and Tibet to the ocean, with ~20% of this attributed to the I/S. However, the rivers of Myanmar are the least well documented of any major global rivers. The Irrawaddy is over 2000 km in length, ranks 10th in the world in discharge (13,600m³/yr) and 4th (5th) in suspended sediment load (265 Mt/yr) (Milliman and Meade, 1983; Latrubesse et al. 2005). The sediment load and discharge fluxes cited are based on Gordon (1885), who presented monthly data from 1869 to 1879 to the Royal Geographical Society without details of field methodologies or sampling locations; no systematic study has been undertaken since that time.

We collected a dataset of discharge and sediment load in June 2005 from the original 19th Century study site. We also located the Gordon's original 550 page report from 1879 that contains the full daily dataset, survey maps, channel cross-sections and a detailed description of sampling techniques. The data have been digitally reconstructed using OCR software, every number has been checked against the original report, and it is of remarkable quality. However, the original load calculations derived from the data are flawed, in part because there are arithmetic errors and the sediment

loads calculated by Gordon did not include all sediment $>0.45\text{mm}$ (leading to $\sim 20\%$ under-estimation based on our 2005 dataset). We have re-calculated the discharge and sediment load data; the Irrawaddy transported $445\text{ km}^3/\text{yr}$ of water (a 10-year average) and $355\text{ MT}/\text{yr}$ of sediment ($426\text{ MT}/\text{yr}$ if the material not measured by Gordon is included).

Both the conservative and scaled sediment loads are higher than the commonly cited values and these underestimations have implications for global sediment budgets. Since there appears to be no data available for the Salween, we have simply scaled the Irrawaddy measurements by relative basin size in order to give a crude estimation of fluxes for the Salween River. It may transport an additional 337 MT of sediment, giving a total of 763 MT for the I/S or close to 50% of the modern G/B sediment flux. This research represents the beginning of a long-term project to determine the magnitude of the fluxes of water, sediment, carbon and dissolved constituents along the major rivers of Myanmar and their significance to, and impact upon, denudation rates in the Himalayas and global dissolved and particulate transfer from the land to the ocean.

References

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