

Floods of the Mekong at Chiang Saen, northern Thailand: Archaeological and OSL dating of large floods

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One meter and a half of floodplain sediment buries AD 14-15th C brick temple ruins and cultural layers on the Laos floodplain of the Mekong, across from Chiang Saen Noi. Dark soil layers separating three flood-sediment layers suggest the soils developed on sediment layers deposited by large floods. Little or no deposition occurs between such events. The upper flood layer was probably deposited by the September, 1966 flood that inundated Chiang Saen city to a depth of three meters, with maximum gage height reaching 13.82 m, and peak flow of 23,500 m³/s. In comparison, the depth of the August 2008 flood in the flood plain at the sample site was about 1.3-m: maximum gage height was 10.57 m and peak flow ~15,000 m³/s. Although stage was at least 10 m for three days, the event did not deposit a recognizable sediment layer at the sampling site. In June 2012, during the annual low water period (stage = +2.45m at Chiang Saen), we sampled flood layers from the 11-m high Laos riverbank for single-grain quartz OSL dating. The top of the riverbank is equivalent to a river stage of 13.45 m. The floodplain, extending about 1 km to either side of the channel, presumably accumulates 0.35-0.6m thick sediment layers during infrequent overbank floods that are 3-4m deep across much of the floodplain. On the Thai side are the ruins of Chiang Saen Noi, founded in AD 1329 on similar banks about 10-m above low water (described by Wood et al., 2008, *Geomorphology*, 101, 510-523). Subsequently we obtained small-aliquot quartz SAR OSL ages on floodplain silt 4-7-m deep of 4,750 ± 260, and 5,600 ± 310 years. Thus, this site began accumulating floodplain silt over bedload gravel of the former channel about 5,000 years ago. No clear flood layers occur in the surficial 0.5-m thick AD 14-15th C cultural layer. The new Laos site is the best paleoflood record discovered to date for the upper Mekong River. Once dated, the stratigraphy will provide a better understanding of the frequency of large floods on the Mekong.

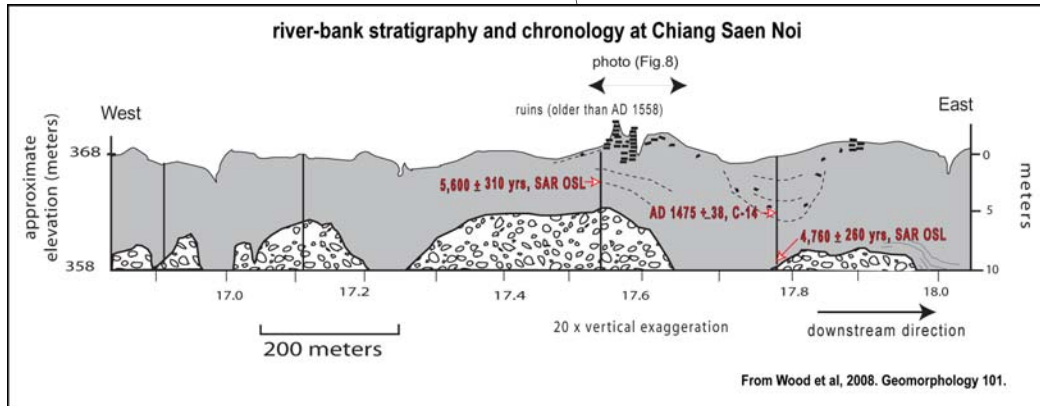
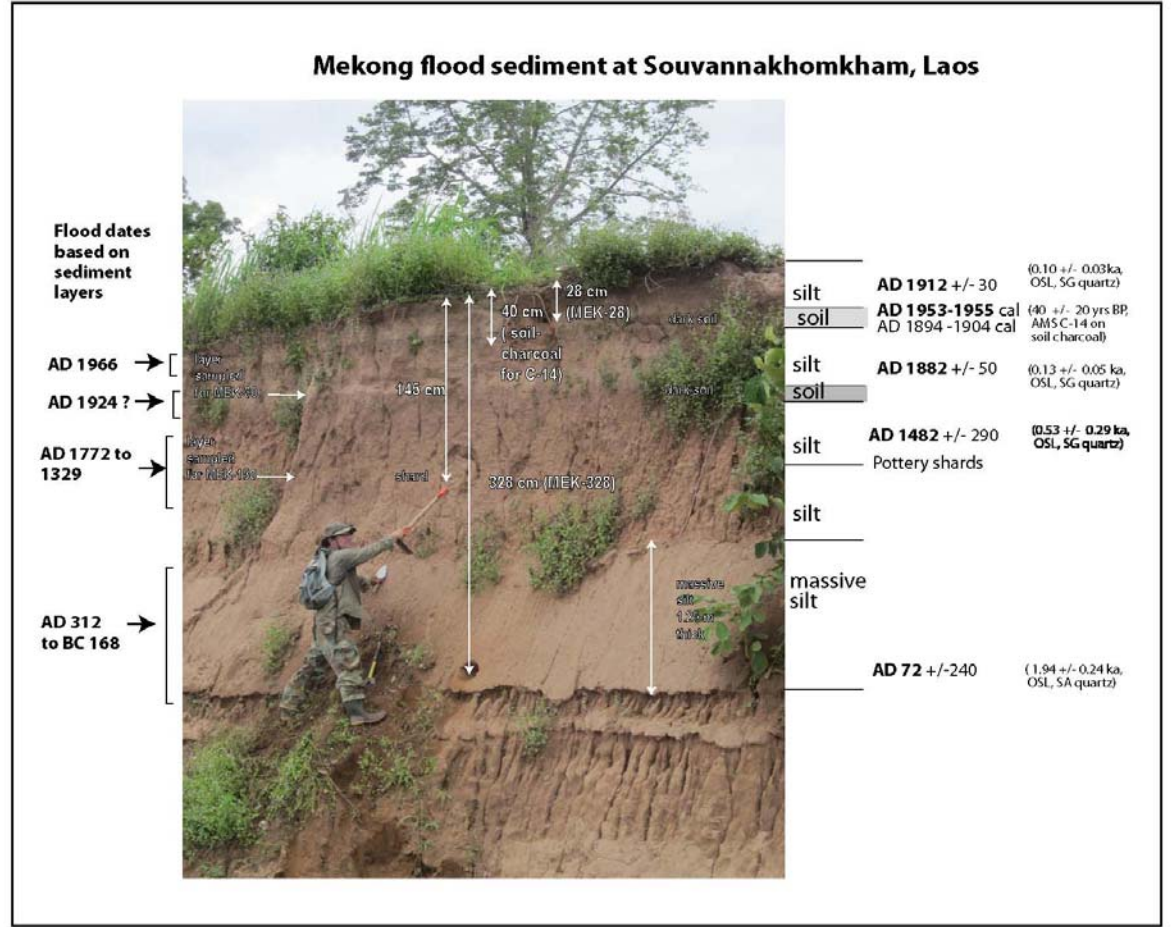
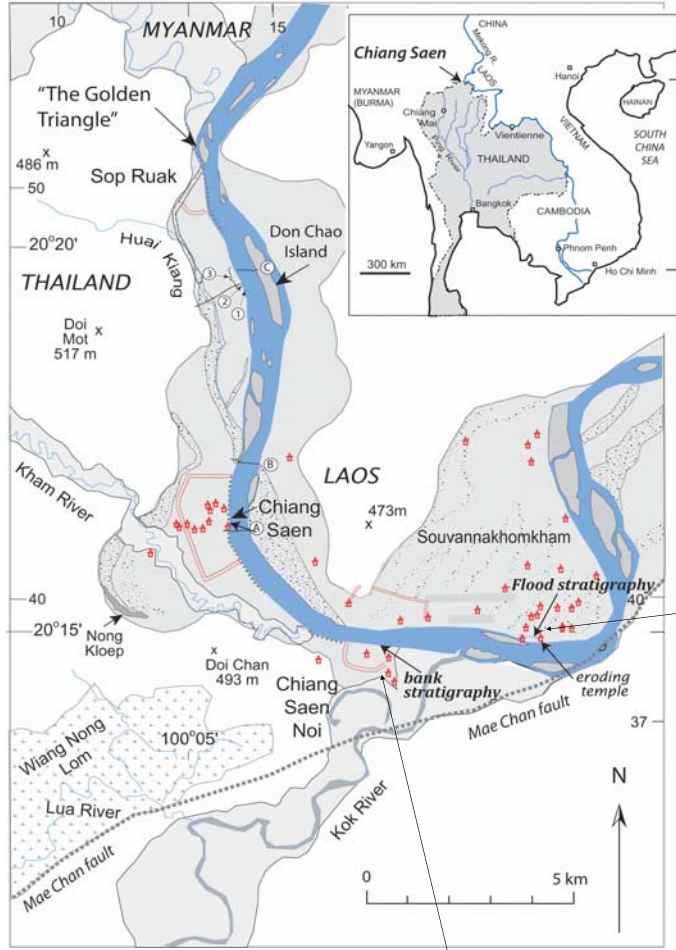
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YEAR	CHIANG SAEN	VIENTIANE
	peak discharge (m ³ /s) / max. gage height (m)	peak discharge (m ³ /s) / max. gage height (m)
1924	no data	25,800 / 12.7
1966	23,500 / 13.8	25,000 / 12.7
2008	13,300 / 10.6	23,500 / 13.7

from Adamson and Tospornsampan (2009)

Daily discharge records at Chiang Saen began in 1960. Discharge records at Vientiane, Laos began in 1913.

We sampled discrete silt layers to extend the record of large floods in the middle Mekong.

1 ½ meters of floodplain sediment buries AD 14-15th C brick temple ruins and cultural layers on the Laos floodplain of the Mekong, across from Chiang Saen Noi.

OSL and C-14 ages indicate the upper 2 layers, each 0.4-m thick, bounded by dark soils, are the depositional record of the 100-yr-recurrence flood of 1966, and the flood of 1924.

Over the cultural layer (shards and bricks), is 0.7-m of silt with SG OSL age AD 1482 ± 290 yrs, upon which a dark soil developed.

Interpretation of this 0.7-m sediment thickness is that it represents only 1 or 2 post AD 1558 floods.

Implication is that 3 or 4 large floods have occurred since this area was last occupied ~ AD 1558.

Floods of this size inundate the city of Chiang Saen, ~2 to 3 m.

Remaining question is: Does each large flood (≥23,000 m³/s) deposit a > 0.4-m-thick layer at this site?

On the Thai side, SAR OSL ages indicate that much of the floodplain at the site of Chiang Saen Noi began building over bedload gravel, ~5,000 years ago.

References
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 Wood, S.H., Ziegler, A.D., and Burdamsin, T., 2008. Floodplain deposits, channel changes and riverbank stratigraphy of the Mekong River area at the 14-th Century city of Chiang Saen, northern Thailand. Geomorphology 101, 510-523.