Title: Is there active tectonics at the Nile cataracts in Sudan? An archaeoseismological study

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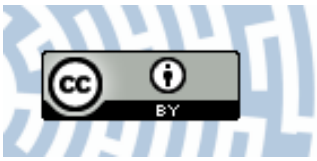

Is there active tectonics at the Nile cataracts in Sudan?
An archaeoseismological study

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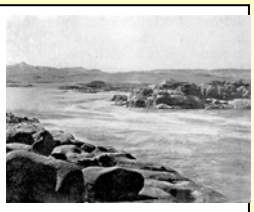
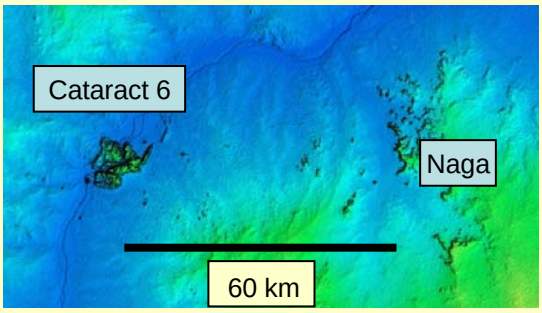
An earthquake nearby Cataract 6
Could easily damage Naga temples



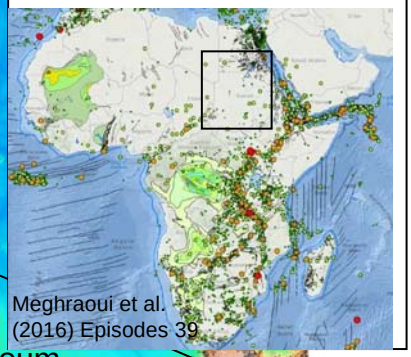
Cataract 6
(Haggard, 1908)



- Nile carved >2 km deep canyon during Messinian time
- Unable to remove 6 cataracts in millions of years
- Are there active faults at cataracts?

- Instrumental seismic record: 20 years only
- No historical data
- **Archaeoseismological survey in progress**

Lack of
intraplate seismicity
in Sudan



Meghraoui et al.
(2016) Episodes 39

Khartoum

Evidence for active tectonics –
Archeoseismology of Naga (1-3rd century)

EMS98
Intensity I = IX

Amon temple

Shifted
blocks

Lion
temple

Fractured arch
/ Tilted wall

Hathor temple

Shifted
blocks

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Seismic risk assessment in Africa

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The Nile is the longest river on earth, accordingly with huge drainage and major floods, regulated by the African monsoon. Significant amount of sediment is carried by the river; its deposition forms alluvial plains along most of its course. However, in Upper Egypt and northern Sudan there are six major and several minor cataracts totalling 327 km in length. There the river flows directly on bedrock, and a multitude of islands and rocks in the riverbed makes navigation hard or impossible throughout much of the year. Obviously, the Nile is unable to remove these obstacles from its flow (despite its ability to carve a deep canyon in the African continent during Messinian lowstand of the Mediterranean Sea). It has been suggested that the Cataract Nile is in a youthful stage, flows along structurally controlled turns and that earthquakes in southern Egypt prove that portions of the Nubian Swell are still tectonically active (Thurmond et al., 2004). However, the Sudan part of the river does not show any seismic activity. An archaeoseismological study is in progress to locate evidence of past earthquakes preserved in monumental architecture erected during the past 3500 years. Pyramids in Meroe display masonry shifted in plane of the wall: this was caused by one or more earthquakes of intensity I_0 = 9 on the Archaeological Intensity Scale. We suggest that an ongoing systematic study of monumental stone and adobe buildings along the Nile in the region of the Nubian Swell will find further evidence of major earthquakes in the region, contributing to a better understanding of seismic hazard in Sudan.

Reference

Thurmond, A.K., Stern, R.J., Abselsalam, M.G., Nielsen, K.C., Abdeen, M.M., Hinz, E. (2004): The Nubian Swell. - Journal of African Earth Sciences 39, 401-407.