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Hydrology and Earth System Sciences Discussions

Interactive comment on "Using multi-source satellite data for lake level modelling in ungauged basins: a case study for Lake Turkana, East Africa" *by* N. M. Velpuri et al.

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We thank Dr. Garcin for his interest in our paper. We address his comments below.

The basin boundary we used in this study was based on Revanga et al., 1998; Wolf et al., 1999; WRI, 2002 and International River basin register, 2002. There seems to be some confusion in terms of Lake Turkana basin boundary and basin area published in literature. Below is the list of publications (listed chronologically) that reported Lake Turkana basin area with area ranging from 131,000 to 209, 157 sq. km.

Publications that report Lake Turkana basin area over 200,000 sq. km used either

GTOPO (Hydro 1K) elevation data or SRTM elevation data to delineate Lake Turkana basin along with other basins in Africa.

However, as pointed by Dr. Garcin, a close observation of the rivers delineated from SRTM elevation data showed a river network connecting Lake Turkana with smaller rift valley lakes in Ethiopia such as Lake Chew Bahir, Lake Chamo, and Lake Abaya. Nevertheless, since these lakes are not hydrologically connected to Lake Turkana (Nyamweru, 1989), we corrected for the Turkana basin boundary delineated from SRTM by removing the sub-basins corresponding to those lakes. Furthermore, we removed some spurious streams and rivers flowing into Lake Turkana via Kerio River in the south of the basin. Resulting Turkana basin thus obtained was found to have an area of 145,500 sq. km and very closely matches to the basin boundary depicted in the references provided by Dr. Garcin. See figure shown below.

We used this revised basin boundary to re-run the model and found that results obtained after re-running the model are not very different from the one published now. However by using correct basin boundary (with reduced runoff into the lake), we found that the overall accuracy of the modelled lake levels showed slight improvement. The mean bias was reduced from 0.36 m to 0.19 m and we thank Dr. Garcin for suggesting this correction.

We have updated the manuscript, figures and accuracy table with the new results, which will be reflected in the revised manuscript.

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Table 1. List of publications that reported Lake Turkana basin area (listed chronologically)

S.No	Reference	Lake Turkana Basin Area (Sq. Km)
1	Hastenrath and Kutzbach, 1983	146,300
2	Revanga et al., 1998	209,157
3	Wolf et al., 1999	207,600
4	Mercier et al., 2002	131,000
5	WRI, 2002	209,157
6	International River basin Register, 2002	206,900
7	Johnson and Malal, 2009	146,000
8	This study (original basin boundary from SRTM)	203,000
9	This study (revised basin boundary)	145, 500

Fig. 1. List of publications that reported Lake Turkana basin area (listed chronologically)

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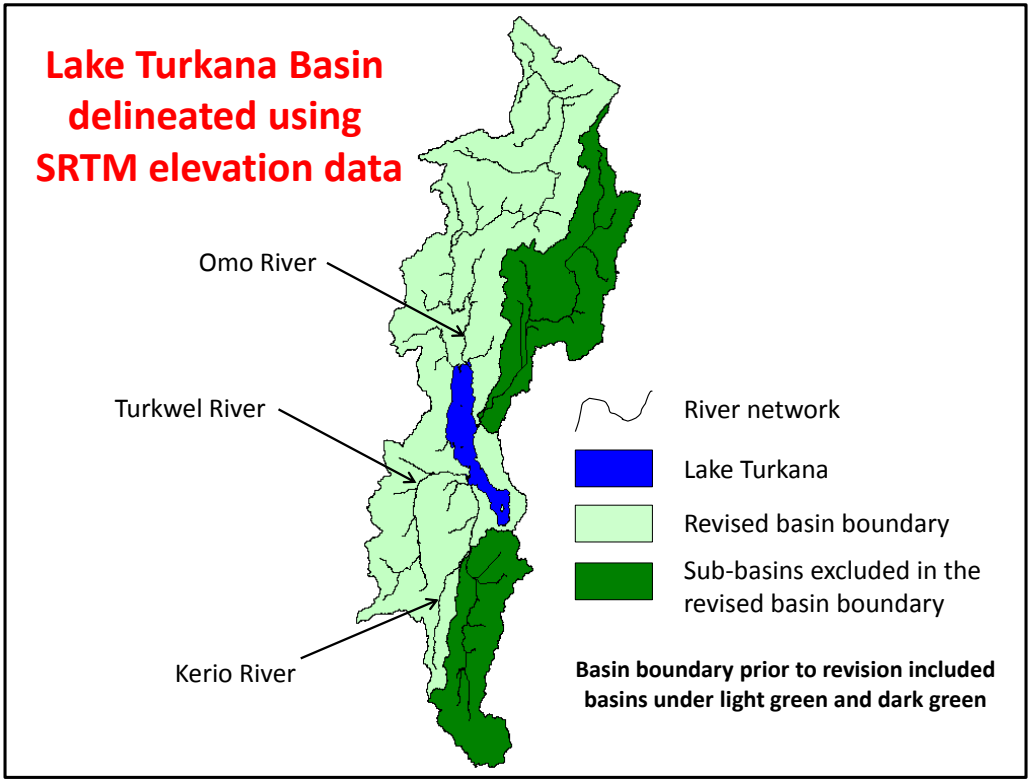

Fig. 2. Figure showing revised Turkana basin boundary and river networks delineated using SRTM elevation data

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