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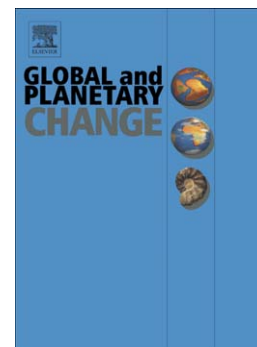
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Glacier Changes in the Ravi basin, North-Western Himalaya (India) during the last four Decades (1971-2010/13)

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Glacier Changes in the Ravi basin, North-Western Himalaya (India) during the last four Decades (1971-2010/13)

Abstract: A glacier inventory of the Ravi basin, north-western Himalaya has been generated for the year 2002 using Landsat ETM+ and ASTER Global DEM (GDEM V2) as the baseline data for the change analysis. The Ravi basin consists of 285 glaciers ($> 0.02 \text{ km}^2$) covering an area of $164.5 \pm 7.5 \text{ km}^2$, including 71 debris-covered glaciers with an area of $36.1 \pm 2.1 \text{ km}^2$ (22 % of total glacierised area) in 2002. Change analysis based on Corona KH-4B (1971), Worldview (2010) and Landsat 8 OLI/ TRIS (2013) images was restricted to a subset of 157 glaciers (covering an area of $121.4 \pm 5.4 \text{ km}^2$ in 2002) due to cloud cover. Glacier area decreased from $125.8 \pm 1.9 \text{ km}^2$ (1971) to $119.9 \pm 4.8 \text{ km}^2$ (2010/13), a loss of $4.7 \pm 4.1 \%$ or $0.1 \pm 0.1 \%$ a^{-1} . The glacier recession rate has decreased, to a minimum for the recent decades (2002-2010/13). The debris-covered glacier area increased by $19.24 \pm 2.2 \%$ ($0.5 \pm 0.05\% \text{ a}^{-1}$) in the Ravi basin. However, there were significant variation in its sub-basins i.e. in Budhil and Upper Ravi sub-basin, where the **debris-covered** area increased by $28.6 \pm 3.1\%$ ($0.7 \pm 0.1\% \text{ a}^{-1}$) and $14 \pm 1.6\%$ ($0.3 \pm 0.04\% \text{ a}^{-1}$), respectively, between 1971 and 2010/13. Field investigation of selected

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