

Investigation of temporal change in glacial extent of Chitral watershed using Landsat data: a critique

Irfan Rashid · Tariq Abdullah

Received: 19 May 2016 / Accepted: 29 August 2016 / Published online: 3 September 2016
© Springer International Publishing Switzerland 2016

Abstract Himalayan glaciers are showing consistent signs of recession similar to glaciers elsewhere in the world with the exception of slight mass gain or stability in Karakoram. Deficient knowledge regarding the processes controlling the glacier dynamics together with remoteness, rugged terrain, insufficient in situ measurements, unsuitable datasets, and scanty network of meteorological stations has always been a big challenge in projecting future glacier dynamics in the region. Here, we present a number of scientific concerns regarding the appropriateness of data sets and methods adopted by a study carried out by Naeem et al. (2016), published in the journal of Environmental Monitoring and Assessment to investigate and project glacier dynamics in Chitral watershed using Landsat data. The use of predominantly snow and cloud covered satellite images especially for 2006 and 2007 strongly questions the glacier fluctuation estimates put forth by the authors. The inferences from existing scientific literature suggesting robustness of semi-automatic methods for glacier mapping challenge the use of unsupervised classification approach for delineating glacier extents as adopted in Naeem et al. (2016). Considering the scientific concerns and loopholes in the study by Naeem et al. (2016), the glacier fluctuations in Chitral watershed need to be reassessed.

Keywords Glacier mapping · Glacier dynamics · Chitral watershed · Classification approach

Introduction

The indicators of glacier recession are very much apparent in Himalayas (Bolch et al. 2012; Dar et al. 2014). The recession is mainly controlled by climate (Akhtar et al. 2008; Bhutiyani 2015; Shrestha and Aryal, 2011; Wang et al. 2015) in addition to aerosol deposition (Ming et al. 2013; Nair et al. 2013; Xu et al. 2015). Various studies have already projected the exacerbated glacial melt under future climate change scenarios (Li et al. 2015; Lutz et al. 2014). In most of the Himalayan states including Pakistan, the mountain glaciers have an important role in regulating the water availability (Immerzeel et al. 2012). These anticipated changes in the stream flows pose a threat to the socioeconomic and geopolitical stability of the region. It, hence, becomes imperative to analyse the magnitude of the climatic changes and study their influence (Romshoo et al. 2015). Although there is a huge volume of literature about glacier dynamics and hydrology, yet our knowledge is limited so far as Himalayan cryosphere is concerned. Based on limited data and little understanding of complex Himalayan system, a controversial report by Intergovernmental Panel on Climate Change (IPCC 2007) exposed the knowledge gaps that still persist in order to understand the behaviour of Himalayan glaciers (Cogley et al. 2010). These gaps are due to scanty network of meteorological observatories and scarce

I. Rashid (✉) · T. Abdullah
Department of Earth Sciences, University of Kashmir, Hazratbal
Srinagar, India
e-mail: irfangis@gmail.com