

## ***Interactive comment on “Climate change impacts on hydroclimatic regimes and extremes over Andean basins in central Chile” by Deniz Bozkurt et al.***

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1. The metrics currently included in Figure 4 are based on mean annual runoff, and the calibration results reported by the previous studies by DeMaria et al. are based on monthly flows. In my opinion, it would be very informative to see evaluation results based on daily time steps, especially considering the analyses of extremes (Figure 11). If the authors have daily observations and simulations of runoff, something like the Kling-Gupta Efficiency (KGE; Gupta et al. 2009) would help with this purpose. More importantly, additional metrics based on signature measures of hydrologic behavior (e.g., Yilmaz et al. 2008; Hrachowitz et al. 2014) would provide information on how VIC is doing on simulating high/low flow volumes, basin flashiness, etc.

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Response: We acknowledge your comments in this crucial point. Given the fact that the audience of HESS would be interested in seeing more evaluation statistics rather than referring to Demaria et al. (2013a, b), we have expanded the model evaluation part and added more evaluation statistics such as NSE, KGE, PBIAS at monthly and annual time series (results included in table in separate file). Furthermore, we have included two more stream gauges of Itata and Rapel basins so that we could provide a detailed validation statistic for each basin. Finally, we will use three available daily flow data to evaluate model performance in representing CT and PDF for Mataquito, Maule and Itata basins.

2. The calibration of soil parameters in VIC bring the risk of creating artificial changes in basin-averaged water storage. Did the authors check that  $P \sim Q + ET$  over the historical baseline period? If the previous is not true, the model very likely produced increase/decrease of water stored in the soil column, and this could amplify projected monthly changes in Figure 10.

Response: No, we didn't check this, but we see that the VIC model underestimates ET with respect to GLEAM data in summer season. We agree that there may be some inconsistency in the historical and modeled water balances, largely due to ET. We will include another reference dataset (e.g. MODIS) in addition to GLEAM to make our analysis more robust, and have more certainty on the described model biases.

3. Overall, hydrologic modeling decisions such as model structure and parameter values may have large implications on projected climate change impacts (e.g., Wilby 2005; Jiang et al. 2007; Bae et al. 2011; Najafi et al. 2011; Surfleet et al. 2012; Surfleet and Tullos 2013; Vano et al. 2012; Mendoza et al. 2016; Mizukami et al. 2016). Moreover, VIC response to snow parameters is quite sensitive (e.g., Elsner et al. 2014; Mendoza et al. 2015). A discussion on these sources of uncertainties – especially on the VIC parameters included in the calibration process – would help to provide context for model performance and hydrologic change results reported in the paper. The authors could also look at the work by Robert Wilby (e.g., Wilby and Harris 2006; Wilby and Dessai

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2010) for further discussion on additional sources of uncertainty.

Response: Although more information on that is given in DeMaria et al. (2013a), we agree that the discussion section indeed lacks of a discussion on sources of uncertainties. We will improve the discussion part adding more content on the sources of uncertainties.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-690/hess-2016-690-AC1-supplement.pdf>

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