Foreword to the special issue: decadal scale drought in arid regions

Zong-Liang Yang^{1,2} · Zhuguo Ma¹

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Under the support of the National Basic Research Program from The Ministry of Science and Technology (MOST) of the People's Republic of China, a project entitled “Mechanisms and Influences of Decadal Climate Change in Global Arid and Semi-arid Regions” was conducted during the period of 2012–2016. This special issue assembles the papers that were directly funded by the grant or solicited to represent a broad range of topics, which are briefly reviewed below.

The papers can be grouped into four main research themes. The first group depicts the spatiotemporal characteristics of precipitation based on instrumental data (Pei et al. 2017; Yang et al. 2017) and proxy data (Zhang et al. 2017). These papers then connect the precipitation variability to various controlling factors, including the Pacific Decadal Oscillation.

Based on field observations, reanalysis, and numerical modeling, the second group studies the role of land–atmosphere interaction in modulating runoff variability and their trends over arid and semi-arid regions in China (Li et al. 2017b; Zheng et al. 2017). These studies have revealed distinct regional patterns and trends, suggesting complex relationships between runoff variability and terrain, soils, vegetation, and climate.

Land use and land cover changes are known to cause regional changes in hydrology and climate. Focusing on arid and semi-arid regions in China, the papers in the third group study the climatic impact of vegetation degradation (Chen et al. 2017) and reforestation (Wang and Cheung 2017). Xu and Yang (2017) further assess relative contributions of increased greenhouse gases and land use and land cover change to climate change. Li et al. (2017a) quantify natural versus anthropogenic climate change.

The fourth group addresses the uncertainties in estimating historical drought changes in arid and semi-arid regions (Dai and Zhao 2017) and documents the uncertainties in the modeled

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✉ Zong-Liang Yang
liang@jsg.utexas.edu

¹ Key Laboratory of Regional Climate-Environment Research for Temperate East Asia, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China

² Center for Integrated Earth System Science, University of Texas at Austin, Austin, TX 78712, USA

historical and future drought changes (Zhao and Dai 2017). These results provide a solid background for assessing the vulnerability of and risk to water resources over arid and semi-arid areas under the combined effects of decadal drought and human activities (Xia et al. 2017).

These research findings have helped advance our systematic understanding of the mechanisms and influences of decadal drought in global arid and semi-arid regions from perspectives of natural processes and human activities. They also have provided theories and methods for projecting future decadal scale droughts as well as services for regional and social sustainability.

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