Advancing Drought Modeling: Harnessing Innovative GEE-derived Parameters for Improved Fusion-based Analysis at Regional Scale

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Abstract

Abstract: This study proposes a novel fusion-based approach using Google Earth Engine (GEE) to accurately model distinct drought phenomena in various environmental regions, with Iran as a case study. The method integrates Environmental Parameters (EPs) - Vegetation (Veg), Temperature (Tem), Humidity (Hum), and Evaporation-Transpiration (ET) - with auxiliary parameters such as land-cover, topography, and wind-speed to improve modeling accuracy. A 39-year (1982-2020) time series of 14 Remote Sensing (RS) indices and 18 Ground-Based (GB) drought indices were used as input and output, respectively, for training and testing machine learning algorithms in three phases. The results obtained during the test period (2015-2020) from each phase were employed in the next phase based on a hereditary procedure to evaluate the potential of the proposed indices and their associated EPs (group of indices). The Consolidated Fusion-Based Drought Model (CFDM) was developed as the final product, which demonstrated superior accuracy and stability compared to other models, with an overall accuracy (OA) higher than 90% for all GB indices. As a result, the CFDM has utilized for generating drought maps in Iran. Furthermore, the effectiveness of the simultaneous use of auxiliary parameters and EPs was demonstrated through the Prevalent Fusion-Based Drought Model (PFDM). Our approach entails a systematic framework that incorporates innovative parameters (indices/indicators) to accurately model drought phenomena. This can contribute to the development of effective management strategies.

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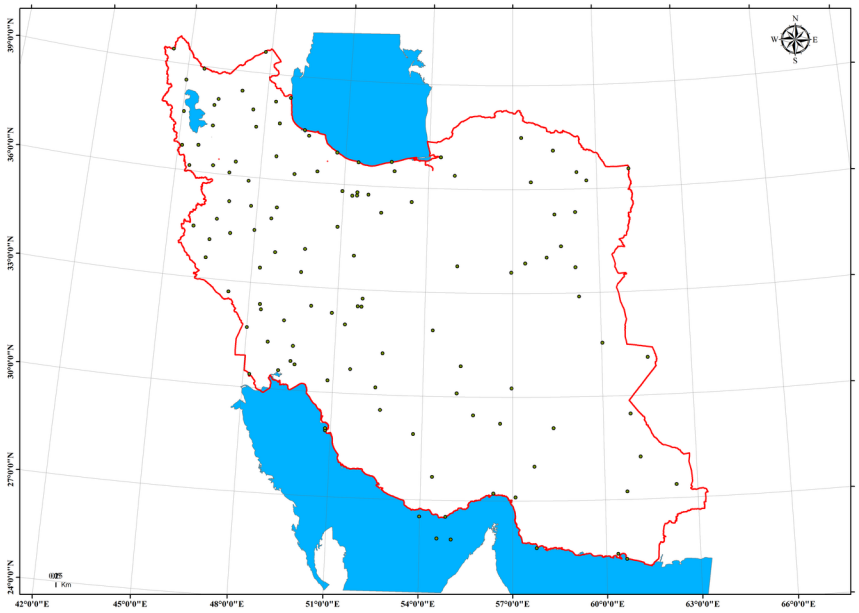
`Final_Fusion_Based_Drought_Modeling_14RS_18GB.docx` available at https://authorea.com/users/672446/articles/858064-advancing-drought-modeling-harnessing-innovative-gee-derived-parameters-for-improved-fusion-based-analysis-at-regional-scale



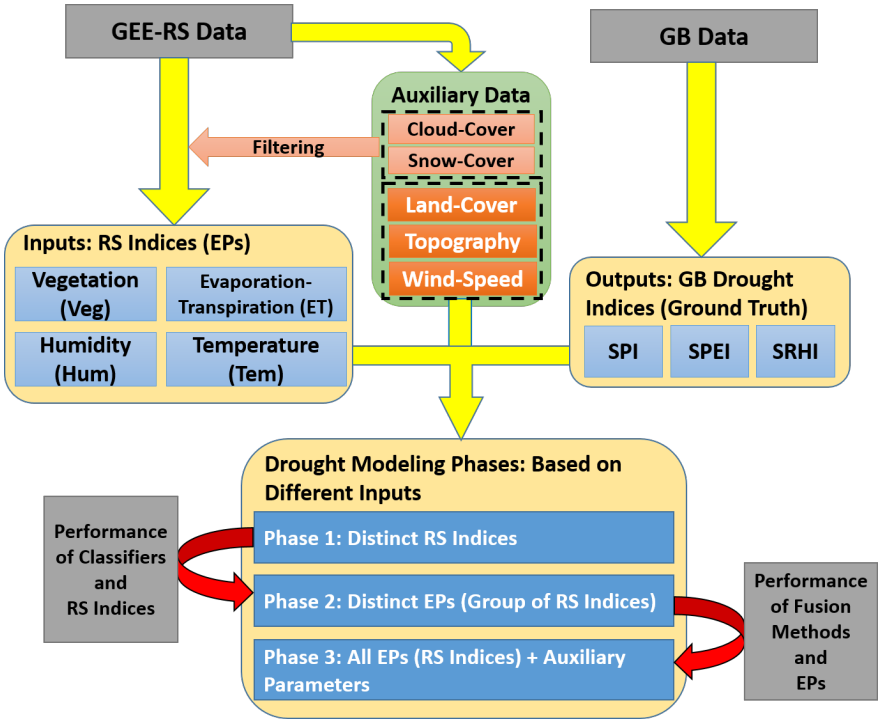


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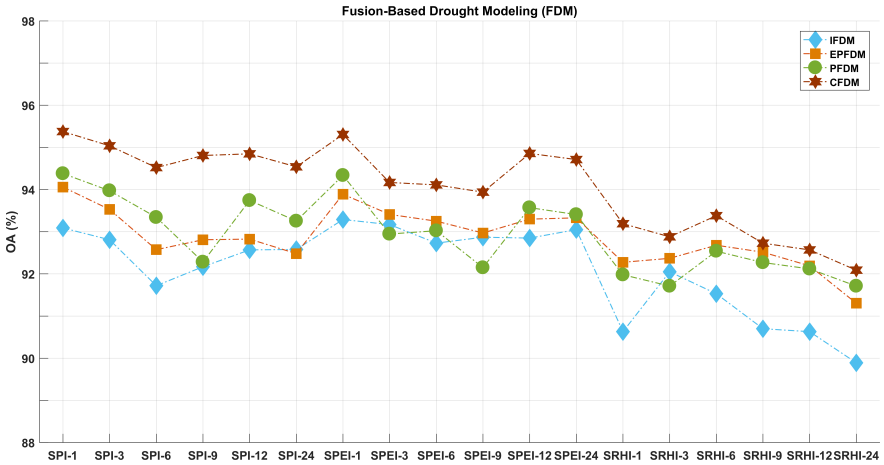
Fig. 5_EPs-Performance.rar available at https://authorea.com/users/672446/articles/858064-advancing-drought-modeling-harnessing-innovative-gee-derived-parameters-for-improved-fusion-based-analysis-at-regional-scale



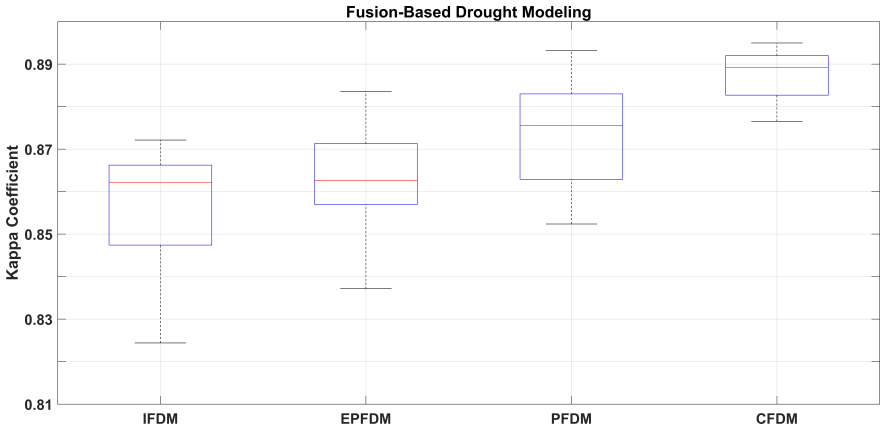


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Figure-5_Evaluating the potential of EPs in drought modeling.docx available at https://authorea.com/users/672446/articles/858064-advancing-drought-modeling-harnessing-innovative-gee-derived-parameters-for-improved-fusion-based-analysis-at-regional-scale

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Figure-8_Monthly drought condition prediction maps achieved by CFDM in 2015, based on SPEI-3.docx available at https://authorea.com/users/672446/articles/858064-advancing-drought-modeling-harnessing-innovative-gee-derived-parameters-for-improved-fusion-based-analysis-at-regional-scale

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Fig. 8_SPEI-3.rar available at https://authorea.com/users/672446/articles/858064-advancing-drought-modeling-harnessing-innovative-gee-derived-parameters-for-improved-fusion-based-analysis-at-regional-scale