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Identifying significant factors controlling the tectonic characteristics of the Zagros region (Iran) using factor analysis technique

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The Zagros orogenic belt of Iran is one of the most seismically active collision zones in the World. This region has been widely studied by researchers during the past decades due to its typical tectonic setting. Contrary to the previous studies, this study introduces a new objective approach to identify significant factors controlling the tectonic properties of the study region. For this purpose, the study area was divided into 137 sub-areas each separated from the neighboring one by natural geological and geophysical features. Then, the values of 18 geophysical and geological variables indicating properties such as seismicity, gravity anomalies, topography, faulting and folding were calculated and recorded for each sub-area. After that, the data matrix was analyzed by factor analysis method. Factor analysis as a multivariate statistical technique is used to study the interrelationships among dependent variables, with the goal of representing the total variation of all variables in a smaller number of factors. In this study, 6 significant factors describing 70% of the total variance of the data set were extracted through analysis. After rotating the extracted factors by the Varimax rotation method, the rotated factors were named according to the loadings of variables that factors contain. Accordingly, these 6 representative factors are: seismicity, topography, faulting, folding, diapirism, and gravity anomalies. The values of these 6 extracted significant factors were computed for all sub-areas and the spatial variations of these values across the study region were shown through zoning maps. Among the factors studied in this analysis, and according to the eigenvalues of extracted factors, the seismicity and gravity anomalies factors show the highest and the lowest significance, respectively. This study presents the usefulness of factor analysis method in reducing the number of variables into a fewer number of factors and also identifying the interrelationships among variables used in geological studies.