# Global assessment of sub-national drought impact based on the Geocoded Disasters dataset and land reanalysis

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## S1 Sensitivity of drought cluster centroids map to upscaled resolution

Upscaled map of the drought cluster centroids was generated using four resolutions of the grid cells within which we count the centroids: 0.25° (original), 1.25°, 2.5°, and 5°, shown in Fig. S1. The drought clusters were generated from third layer's soil moisture. In the results part, we showed the case of 2.5°. Counting centroids with original resolution (a) does not provide regional trends, because the plots are scattered sparsely. Therefore, by counting the number of centroids within a certain larger area (but still small enough to be meaningful compared with GDIS spatial resolution), we can observe the areas that experience frequent hydro-meteorological droughts. Regional trends start to emerge from 1.25°, and 5° is slightly larger than the GDIS resolution. Therefore, 2.5° was chosen.
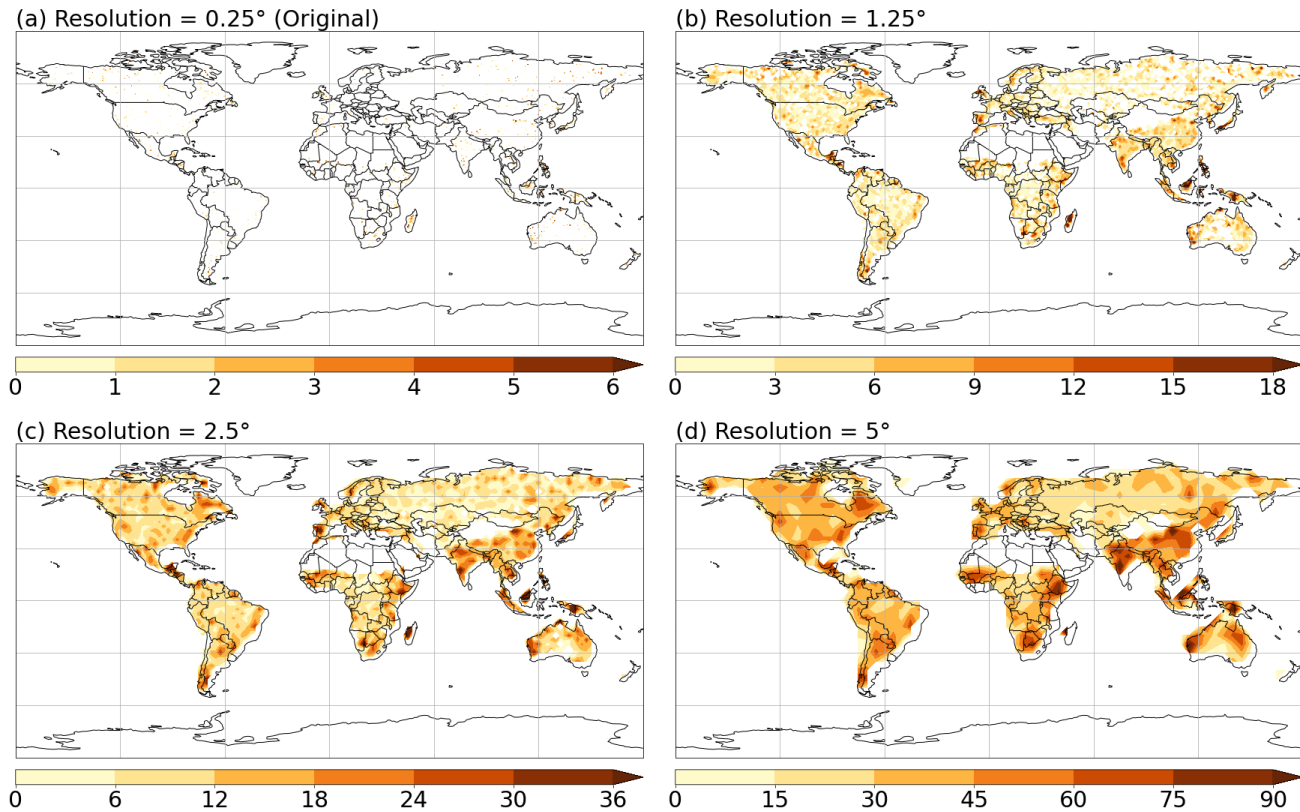
**Figure S1: Sensitivity of drought cluster centroids map to upscaled resolution. (a) 0.25°, (b) 1.25°, (c) 2.5°, and (d) 5°.**

## S2 Drought-prone areas in different soil layers

The locations of drought-prone areas are almost the same when drought clusters are generated by soil moisture in different
20    soil layers, shown in Fig. S2. The drought-prone areas are most distinguishable from their surroundings and corresponded
best with GDIS drought-prone areas in the third layer case. Drought clusters generated from shallow layer's soil moisture
disperse and the border are relatively unclear from their surroundings. As we mention in the discussion part, the serious
socio-economic events such as those listed in GDIS, especially those in drought-prone areas, are the events that were caused
by the soil moisture deficit not only on the surface layer but also down to the root.

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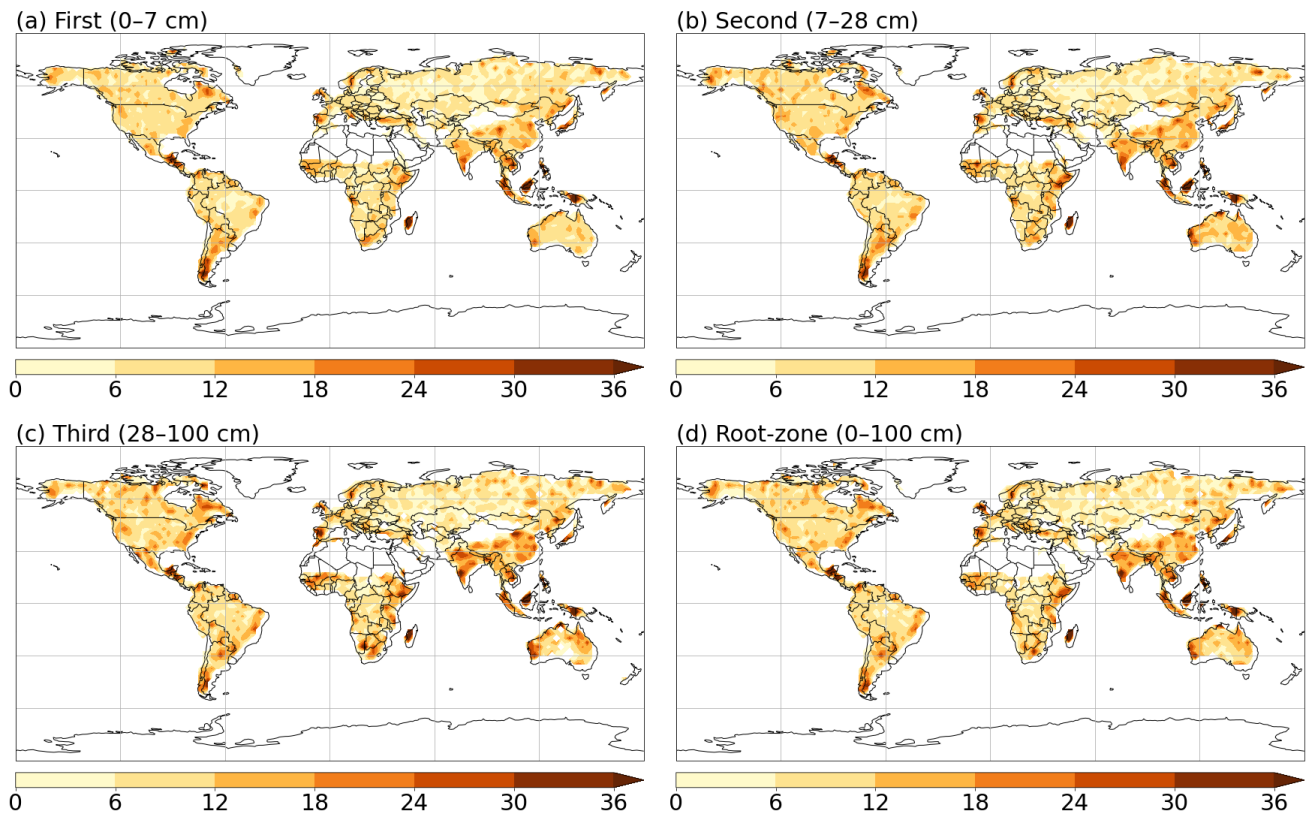
**Figure S2: The number of drought cluster centroids based on ERA5-Land in different soil layers. (a) First layer, (b) Second layer, (c) Third layer, and (d) Root-zone layer.**