Streamflow and Water Stress

Using the Noah36+CHIRPS+MERRA2 FLDAS runs (updated since McNally et al. 2017), we route total runoff (surface runoff + subsurface runoff) using the HYMAP2 router (Getirana et al., 2017) to produce streamflow at each pixel (m3/sec). The average of the routed streamflow is calculated for each Pfafstetter basin level 6 from the USGS HDMA database (Verdin 2017) and this average is converted to a volume of water per month (m3)

Next, we compute, Water Stress (i.e. runoff per capita) using WorldPop (http://www.worldpop.org) Africa population estimates (Linard et al. 2012) for the year 2015. These data are aggregated to the Pfafstetter basin level 6. Basin level monthly streamflow is then divided by these basin level population estimates to derive streamflow per capita.

Streamflow per capita is then classified per a modified version of Falkenmark (1989). We use a 12-month moving window to represent the water availability a location has experienced over the past year and map the classification based on the thresholds in Table 1. These results are shown in the “Water Stress <Month Year>” map.

Table 1. Annual (12-month moving window) Falkenmark categories

category	m3/yr/cap
no stress	>1700
stress	1000-1700
scarcity	500-1000
absolute scarcity	<500

Water Stress Anomalies

Using the average 12-month total for each month (Climatology), based on the 1982-2016 historic record, streamflow per capita was computed as described above to generate climatological water stress for each month. Water stress for both climatology and the current month was assigned a numeric value 1-4 (stress to no stress) which allowed us to compute the difference from the current water stress classification from the climatology.

Streamflow Anomalies

The mean streamflow for each month (Climatology) was calculated based on the 1982-2016 historical record and this streamflow was summarized to the Level 6 Pfafstetter polygons, as well. Anomalies are calculated as a percent of the mean as:

Anomaly (%) = ((“Streamflow <Month Year>: - “Climatology <Month>”) /“Climatology <Month>”) * 100

References

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