Prospective tracking and modeling of the impact of hydroclimatic factors on the ongoing COVID-19 pandemic

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Applications & approaches

Goal: quantify the role that climatic and hydrometeorological factors play in temporal and spatial variability in COVID-19 transmission

Approaches:

Integrate EO with detailed COVID-19 data on case counts, estimated infection rates, hospitalization and deaths, along with covariates related to demography, policy, and health system capabilities.

Analysis methods include empirical regression and machine learning techniques to detect hydrometeorological signals alongside SEIR models modified to include hydroclimate-sensitive R_0 and, potentially, contacts and comorbidity coefficients

Expected results & real-time applications

1. Assessment of the **feasibility** of extracting hydrometeorological signal in this first wave of COVID-19 cases.
2. Estimates of the **direction and magnitude of hydrometeorological sensitivities**.
3. Empirically-derived estimates of **SEIR model coefficients**, to generate EO-informed projections at state and country level.
   - This includes *scenario* analysis of sensitivities, allowing us to evaluate the potential importance of hydrometeorology and the value of information in EO even in the context of significant parameter uncertainty
4. Integration of EO to the operational **JHU COVID-19 dashboard**, as predictors of upcoming data interpolation and imputation products and, if results justify it, data available for display and download.

Timeline: first analyses will take place during the first wave of cases (through early summer) in order to interpret the upcoming flattening of the transmission curve. More mature analyses will inform projections of the hypothesized second wave of cases that could come next fall/winter.

Earth Observations

1. NASA Forward Processing Instrument Team (**FPID**) analysis: near real-time surface meteorology and soil moisture estimates
2. GPM **IMERG NRT-Late Run**: higher spatial and temporal resolution precipitation, not model dependent
3. *CHIRTS experimental daily near-surface air temperature*
4. *SMAP L2_SM_P or L2_SM_SP soil moisture product*
5. MODIS **Land Cover Classification and Vegetation Indices**: to classify and interpret ecological seasonality