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STATEMENT OF PURPOSE:

It is estimated that up to million Californians rely on small, shallow domestic wells as their primary source of drinking water. In California's Central Valley, drought and the over-exploitation of aquifers threatens domestic well security, which reached a fever-pitch in the 2012-2016 drought, when a State of Emergency was declared, and Federal and State funds were used to haul in emergency water tanks for domestic well reliant populations. Modeling and mapping, let along predicting future domestic well failure is a woefully understudied topic due to a historical lack of data on well failure (to calibrate and validate models), and well construction (to understand the physical properties of wells that relate to well failure). Recent developments in California's Open and Transparent Water Data Platform (AB-1755) has made water data in California more transparent and available than ever before. In particular, well construction information, validation datasets of actual well failure, and groundwater level measurements are concurrently available, enabling the first-ever regional-scale models of domestic well failure in California's Central Valley. This research utilizes big geospatial timeseries data to model domestic well failure, and machine learning models coupled with climate change predictors to predict future vulnerability to well failure. Visualizing the sheer number of spatial layers involved in this study in a traditional academic journal is near impossible. The NASA Hyperwall thus presents perhaps the most auspicious opportunity to integrate movies of timeseries data, along with multi-panel plots in a single presentation laid out across 9 large monitors. I am confident that the Hyperwall is the ideal location to tell the scientific story of how large geospatial open datasets and modern machine learning approaches can improve our understanding of domestic well failure, which can then inform resource allocation, adaption plans, and damage estimation in the face of future droughts.

DESCRIPTION OF DATA SETS:

The following 3 datasets are publicly-available and free-to-use data from the California Department of Water Resources (CA-DWR) and the Intergovernmental Panel on Climate Change (IPCC). (1) California Domestic Well Completion Reports: In January of 2018, the CA-DWR open-sourced nearly 1,000,000 digitized well completion reports for wells drilled in the state of California. The data provides information on well type, depth, location of screened intervals, and ~40 additional fields. This dataset represents an unprecedented amount of subsurface hydro-geological information. (2) California Seasonal Groundwater Level measurements: the CA-DWR collects seasonal groundwater level measurements at in the state of California and publishes them to the web. (3) IPCC 5th Assessment: downscaled global climate model data from the IPCC 5th Assessment (temperature, precipitation, and bioclimatic variables).