Identification and Predictability of Flash Drought using the Global ForecastSystem

1. Introduction
   (a) Background information
      - May include discussion of need for concrete definition for flash drought.
      - Definition is addressed via SESR and introduction of criteria here.
      - Other pertinent information. (Determining where GFS stands on drought forecasts may be useful here.)
   (b) Address reason/purpose for the study.
      - Impacts of flash drought and need push "hindcasting" of flash drought to nowcasting or forecasting in order to adapt to them and mitigate impacts.
      - Research questions here.
        → Move identification of flash drought from hindsight to foresight.
        → Determine how well the GFS identifies and forecasts flash drought. (identification and forecast may be considered separately.)
        → Create a product that can be used in the GFS to forecast flash drought (more of a long term goal or future product).
2. Literature review
   (a) Review of literature on flash droughts

(b) Review of literature on model progress and forecast attempts on droughts

(c) Review of literature on GFS and where it currently stands

3. Data

(a) GFS data or GEFS data (ensemble will require bias correction)

- Likely legacy and FV3
- Region is likely over CONUS. Extra code work if over NA or is that a processing issue?
- TBD which models run(s) (e.g., 12Z run, 00Z run, etc.; At which hour does it reinitialize, it if does?).
- Some uncertainty here if working with the model itself, or the output data.

4. Methods

(a) Identify flash drought with the GFS (i.e., realtime analysis).

- Some questions to address here:
  → Determining whether to use pentads vs. window analysis or another type of analysis.
  → Note a synthetic dataset of past data will need to be created for identification (similar to the Kyle Griffin page, but for a longer time period)

(b) Forecast/identify risk area for flash drought (1 week out, 2 weeks, etc.).

- Should become trivial after identification (move time step foreward while using same methodology for identification with synthetic dataset created above)
- Need to address inconsistency in temporal and spatial resolution after the 10 day forecast (deterministic) or 8 day forecast (ensemble)
- Could be identification or percentage of risk forecast.
- "Predictability" needs to be identified and determined here.

5. Results

(a) TBD following actual analysis.

(b) Prediction: First forecast will need much improvement.

6. Discussion

   (a) Does TBD need to be said anymore?

7. Conclusion

   (a) See above three sections for this answer.

Some key words: Flash drought, GFS, drought prediction, ET, PET, SESR (maybe), LSM, Land - Atmosphere