1. Introduction:
Large interannual variability (IAV) in global terrestrial biospheric carbon (C) fluxes has been inferred from observations of atmospheric CO₂ variability (Fig. 1, data from NOAA). It's likely that most of this variability is caused by the response of the terrestrial biosphere to climate anomalies.

2. Motivation:
- Investigate the ability of our version of CASA-GFED3 (Carnegie-Ames- Stanford Approach - Global Fire Emissions Database, v3) to capture the IAV in terrestrial biospheric C fluxes.

3. Method:
- Compared the driver data and results of our version of CASA-GFED3 (CASA hereafter, ⅓°) to atmospheric CO₂ inversion (CarbonTracker, CT, prior ⅓° and posterior 1°) and to published eddy covariance (EC) data for documented large scale climate anomalies (Ciais et al., '05; Delpierre et al., '09; Klijn et al., '06).

4. Results and discussion:
4.1 CASA independent of CT
- Our CASA results are independent of the CT posterior results despite that CT was another version of CASA-GFED3 as prior. Similar to CT posterior, we show higher seasonal amplitude than CT prior. CASA and CT prior showups with no sink. Global fires ~2PgC/yr.

4.2 Impacts of extreme climate anomaly events on C fluxes: comparing CASA, CT (prior and posterior) and eddy covariance (EC) results

4.2.1 2003 summer (Jul-Sep, JAS) drought event in south central Canada
- CASA and CT prior show bigger C sink in south central Canada, while CT posterior shows bigger sink. NPP (net primary productivity) decreased more than Rh (heterotrophic respiration). NEE = Rh – NPP.

4.2.2 2003 summer (Jul-Sep, JAS) and heatwave event in EU
- Coarser resolution driver data in the driver data of CASA (a–c) and CT prior (c–e) and between ⅓° FPAR (c) and 8km NDVI (f) Coarser resolution driver data market fine scale extremes in anomalies. Coarser resolution driver data market fine scale extremes in anomalies. This will underestimate the stresses in the models. Precipitation and temperature: '03 – 98/02 means; FPAR and NDVI: '03 – 00/02 means. Red squares: EC sites. Changes are:
  - '03 – '02. Units: gc m⁻² mo⁻¹.

4.2.3 2007 spring (Jan-May, JFMAM) warming event in EU
- CASA and CT show reduction of carbon sink in S and NE Europe. Both NPP and Rh decreased.

4.3 Conclusions:
- CASA produced gross flux anomalies (GPP and RE) that are generally consistent with EC observations for these 3 regional climate anomaly events.
- Both CASA and CT show lower carbon sink in S and NE Europe. Both NPP and Rh decreased.
- NEE (or FPAR) played a major role in determining flux anomalies in CASA.

5. Conclusions:
- CASA produced gross flux anomalies (GPP and RE) that are generally consistent with EC observations for these 3 regional climate anomaly events. CASA also captured the effects of drought in Canada and warm spring in EU on the sign of the net flux (NEE) anomalies from EC data. CASA NEE was not as consistent with EC data as the EU drought which showed greater reductions in GPP relative to RE than CASA.
- CASA and CT show lower carbon sink in S and NE Europe. Both NPP and Rh decreased.
- NEE (or FPAR) played a major role in determining flux anomalies in CASA.