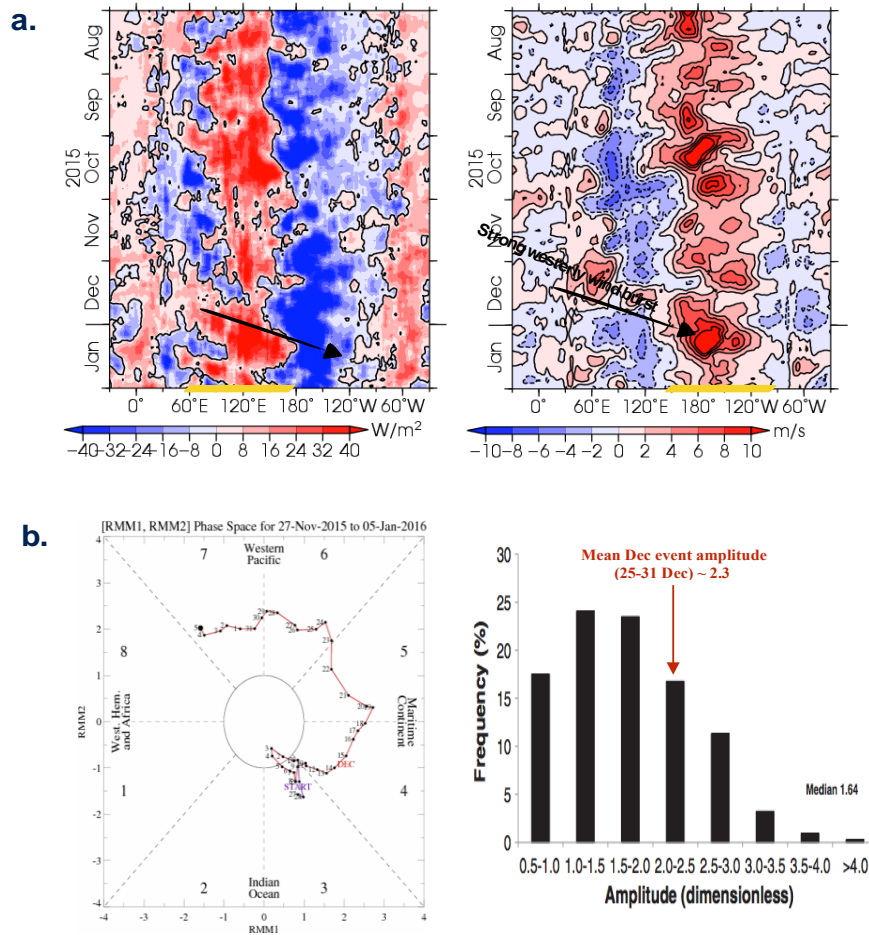


# Synoptic and Climate Attributions of the December 2015 Extreme Flooding in Missouri, USA

## Supplementary Materials



Supplementary Figure 1 (Figure S1)

Longitude-time plot of the 7-day mean **a.** outgoing longwave radiation (OLR) and 850 mb wind anomalies (base period: 1981–2010) averaged over 5S–5N, from July–Dec 2015. The thick yellow bars on the longitudinal axes highlight the ENSO region. (figures courtesy of the Tokyo Climate Centre, Japan). **b.** Phase space diagram for 27Nov2015 - 5Jan2016 illustrating the phase and amplitude of the activity days of the 2015 MJO cycle, based on the principal components (RMM) of the first two EOFs from a combined EOF analysis using 850 hPa zonal wind, 200 hPa zonal wind and OLR. Counter-clockwise movement around the diagram indicates an eastward propagating signal across eight phases from the Indian Ocean to the Pacific and later the western hemisphere. Color of lines distinguish different months and dates are annotated. The farther away from the center of the circle the stronger the MJO signal (figure courtesy of the NCEP–Climate Prediction Center, USA); and frequency distribution of MJO amplitudes during extended boreal winters (1 Nov–31 Mar, 1979–2010). Median value: 1.64. (figure adopted from [36] – Jones C, Carvalho LMV (2014) Sensitivity to Madden–Julian oscillation variations on heavy precipitation over the contiguous United States. *Atmos. Res.*, 147–148, 10–26)

Acronym	Model full name	Center/Institute, country	Resolution (lon.xlat.)	Ensemble size (max)
BCC-CSM1	Beijing Climate Center, Climate System Model, version 1.1	Beijing Climate Center, Meteorological Administration, China	2.8° x 2.8°	1
BNU-ESM	Beijing Normal University—Earth System Model	College of Global Change and Earth System Science (GCESS), China	2.8° x 2.8°	1
CanESM2	Canadian Earth System Model, version 2	Canadian Center for Climate Modeling and Analysis, Canada	2.8° x 2.8°	5
CCSM4	Community Climate System Model, version 4	National Center for Atmospheric Research, USA	1.25°x1.0°	5
CNRM-CM5	Centre National de Recherches Météorologiques Coupled Global Climate Model, version 5	National Centre for Meteorological Research, France	1.4° x 1.4°	10
CSIRO-Mk3	Commonwealth Scientific and Industrial Research Organisation Mark, version 3.6.0	Commonwealth Scientific and Industrial Research Organization/ Queensland Climate Change Centre of	1.8° x 1.8°	10
FGOALS-g2	Flexible Global Ocean-Atmosphere-Land System Model, grid point version 2	LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences, China	2.8° x 1.6°	4
GFDL-CM3	Geophysical Fluid Dynamics Laboratory Climate Model version 3	NOAA Geophysical Fluid Dynamics Laboratory, USA	2.5° x 2.0°	5
GFDL-ESM2	Geophysical Fluid Dynamics Laboratory Earth Science Model 2 with Modular Ocean Model (MOM), version 4.1	NOAA Geophysical Fluid Dynamics Laboratory, USA	2.5° x 2.0°	3
GISS-E2-H	Goddard Institute for Space Studies Atmospheric Model E, version 2, coupled with the Hybrid Coordinate Ocean Model	NASA Goddard Institute for Space Studies, USA	2.5° x 2.0°	5
GISS-E2-R	Goddard Institute for Space Studies Model E, version 2, coupled with Russell ocean model	NASA Goddard Institute for Space Studies, USA	2.5° x 2.0°	5
HadGEM2-ES	Hadley Centre Global Environmental Model 2, Earth System	Met Office Hadley Centre, UK	1.8° x 1.25°	4
IPSL-CM5A-MR	L'Institut Pierre-Simon Laplace Coupled Model, version 5A, medium resolution	Institut Pierre Simon Laplace, France	2.5° x 1.25°	1
MIROC-ESM-CHEM	Model for Interdisciplinary Research on Climate Earth System Model, chemistry coupled version	Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The	2.8° x 2.8°	3
MIROC-ESM	Model for Interdisciplinary Research on Climate Earth System Model	Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute, and National	2.8° x 2.8°	3
MRI-CGCM3	Meteorological Research Institute Coupled General Circulation Model, version 3	Meteorological Research Institute, Japan	1.1° x 1.1°	3
NorESM1-M	Norwegian Earth System Model, version 1, intermediate resolution	Norwegian Climate Center, Norway	2.5° x 1.9°	3

**Supplementary Table 1 (Table S1)**