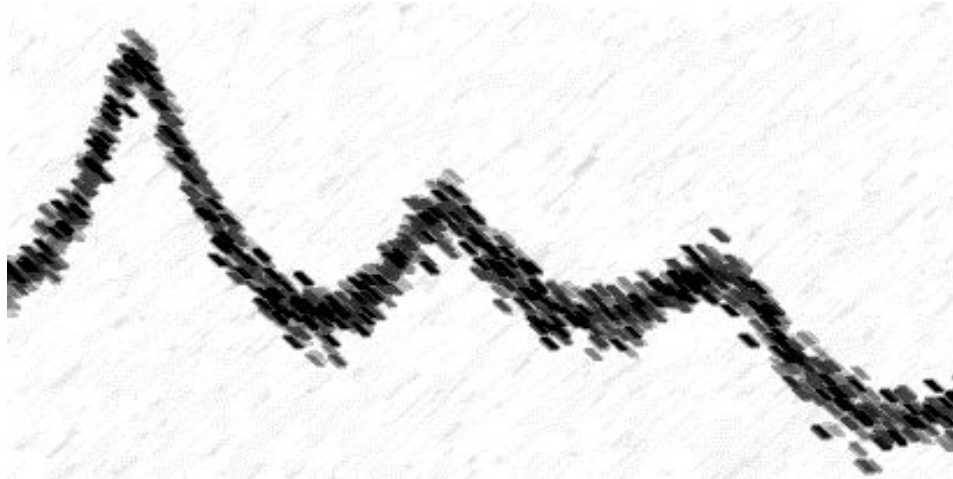


Predicting the occurrence of extreme El Nino events based on Schumann resonance measurements?

Tamás Bozóki^{1,2}, Earle Williams, Gabriella Satori, Ciaran D. Beggan, Colin Price, Peter Steinbach, Anirban Guha, Yakun Liu, Anne Neska, Robert Boldi, and Mike Atkinson



¹Institute of Earth Physics
and Space Science



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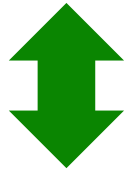


²University of Szeged

OSPP candidate
presentation

Basic idea

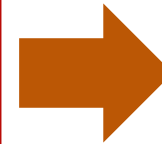
ENSO



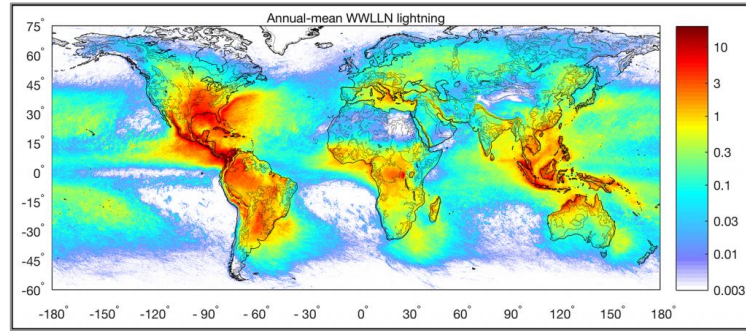
Atmospheric
instability



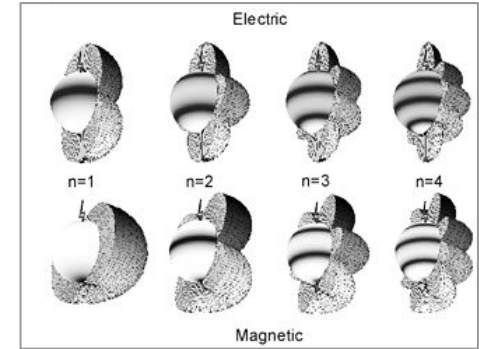
Lightning



Schumann
resonances



(from Aich et al., 2018)

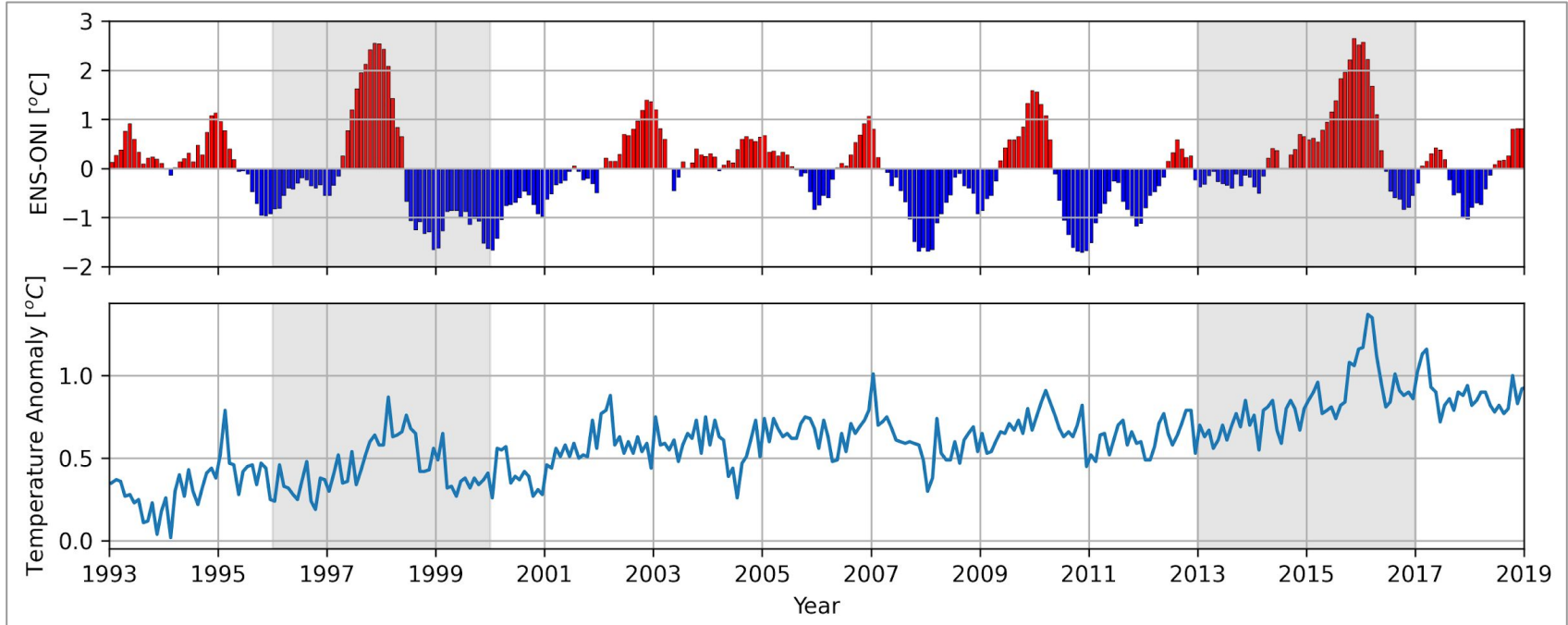


(from Sentman, 1995)



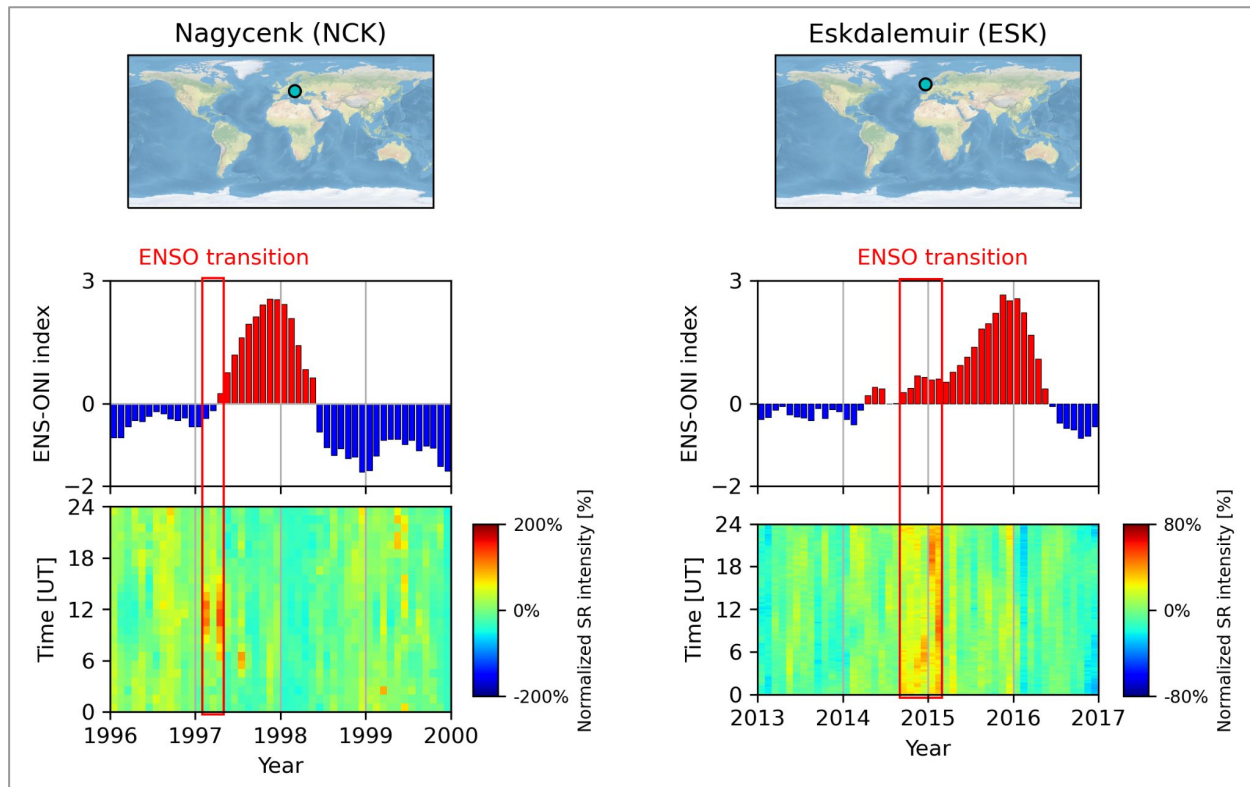
(NASA, visit <https://youtu.be/loav4Ru7PqQ> for the video)

„Super” El niño events



We analyzed the **two strongest El Niño events** of the last quarter century (1997/98 and 2015/16), often referred to as "super" El Niño events.

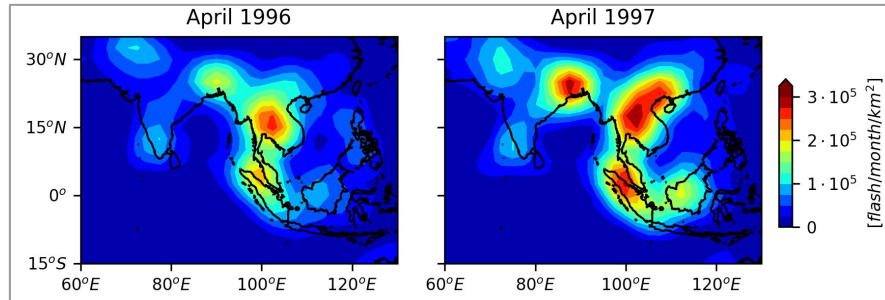
SR-based results



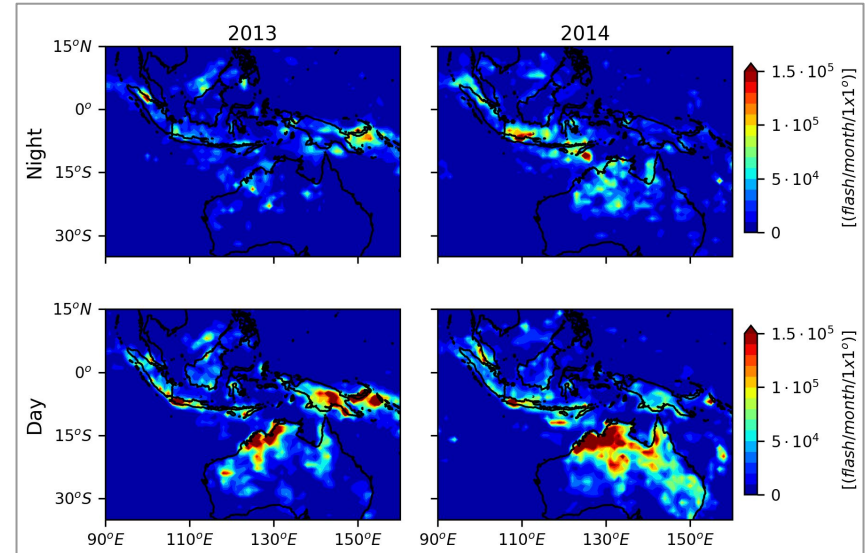
Multistation observations of SR intensity document **common behavior** in the evolution of continental-scale lightning activity in two super El Niño events, occurring in 1997/98 and 2015/16.

Considerable **increases** have been identified from some tens of percent up to a few hundred percents in the **transition months** preceding the two super El Niño events.

Independent lightning observations

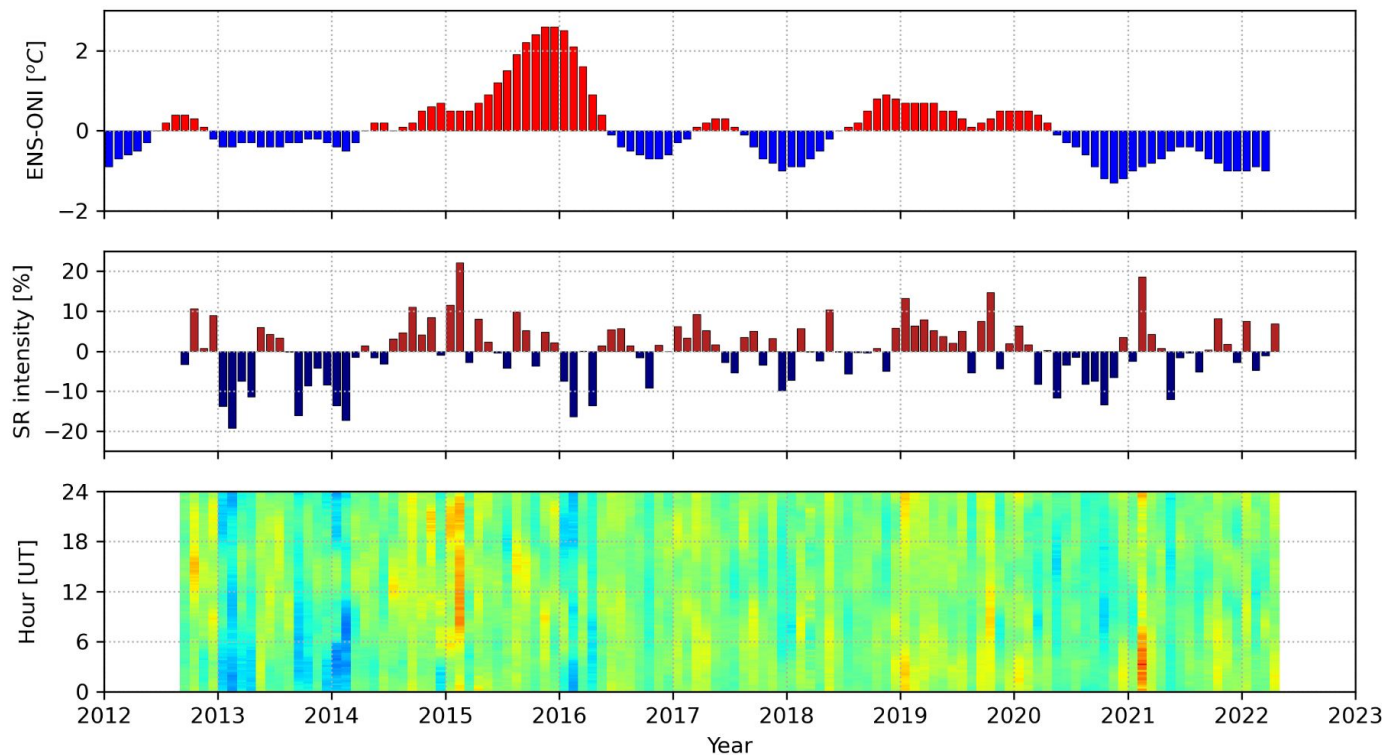


In April 1997, the Optical Transient Detector (OTD) detected **about 35%** more lightning in the Maritime Continent than in April 1996.



In December 2014, the Word Wide Lightning Location Network (WWLLN) detected **about 25%** more lightning in the Maritime Continent than in December 2013.

Quasi-real time global lightning monitoring



Our plan is to set-up a **webpage** dedicated to publish monthly average SR intensity values.

Conclusions

- We aimed to identify common signatures in the temporal evolution of two “super” El Niño events in 1997/98 and 2015/16 by investigating Schumann resonance intensity.
- The analyses directed our attention to the transition months preceding these events when ENSO turned from the cold La Niña to its warm El Niño phase.
- Intensification of SR occurred in the transition months preceding both super El Niño episodes, supporting a key role for thermodynamic disequilibrium.
- The intensification of lightning activity has been confirmed in selected months by independent lightning observations as well.
- Variations in SR intensity may act as a precursor for the occurrence and magnitude of these extreme climate events, and in keeping with earlier findings, as a precursor to maxima in global surface air temperature.
- We plan to set-up a webpage dedicated to publish monthly average SR intensity values.



Thank you for your attention!

JGR Atmospheres

RESEARCH ARTICLE

10.1029/2020JD033526

Key Points:

- Schumann resonance intensities are analyzed from distant stations in connection with two super El Niño events
- Increased Schumann resonance intensity indicates enhanced lightning activity in the transition from cold to warm phase in both events
- Schumann resonance intensity may be a precursor for occurrence of super El Niño events and for maxima in global surface air temperature

Evolution of Global Lightning in the Transition From Cold to Warm Phase Preceding Two Super El Niño Events

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