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## ***Interactive comment on “Severe summer heat waves over Georgia: trends, patterns and driving forces” by I. Keggenhoff et al.***

**Anonymous Referee #1**

Received and published: 24 November 2015

Review of ‘Severe summer heat waves over Georgia: trends, patterns and driving forces’ by Keggenhoff et al.

Recommendation: Major revisions

This studies examines heat waves over Georgia. I applies statistical methods to examine trends in heat waves and their driving factors. It finds that the most severe heat waves occurred during the last 20 years. This is an interesting study and should be considered for publication after my comments have been addressed.

Comments:

1) Trends are identified using the Mann-Kendall test. This test does not take into account the autocorrelation structure of observed temperature time series as shown by

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Koscielny-Bunde, E., Bunde, A., Havlin, S., Roman, H. E., Goldreich, Y., & Schellnhuber, H. J. (1998). Indication of a universal persistence law governing atmospheric variability. *Physical Review Letters*, 81(3), 729.

Bunde, A., J. Ludescher, C. Franzke, and U. Büntgen, 2014: How significant is West Antarctic warming? *Nature Geoscience*, 7, 246-247.

Franzke, C., 2015: Local Trend Disparities Of European Minimum And Maximum Temperature Extremes. *Geophys. Res. Lett.*, 42, 6479-6484, doi: 10.1002/2015GL065011

Franzke, C., 2012: Nonlinear trends, long-range dependence and climate noise properties of surface air temperature. *J. Climate*, 25, 4172-4183. DOI: <http://dx.doi.org/10.1175/JCLI-D-11-00293.1>

Fatichi, S., Barbosa, S. M., Caporali, E., & Silva, M. E. (2009). Deterministic versus stochastic trends: Detection and challenges. *Journal of Geophysical Research: Atmospheres* (1984–2012), 114(D18).

I recommend to use the modified Mann-Kendall test which takes into account also the effects of autocorrelation by

Hamed, K. H., and A. R. Rao (1998), A modified Mann-Kendall trend test for autocorrelated data, *J. Hydrol.*, 204, 182–196.

Franzke, C., 2015: Local Trend Disparities Of European Minimum And Maximum Temperature Extremes. *Geophys. Res. Lett.*, 42, 6479-6484, doi: 10.1002/2015GL065011

2) The study uses various overlapping periods (1961-1990, 1981-2010, 1961-2010). For a trend analysis it might be better to use non-overlapping periods.

3) I suggest to use a lagged CCA (e.g. Perlwitz, J., & Graf, H. F. (1995). The statistical connection between tropospheric and stratospheric circulation of the Northern Hemisphere in winter. *Journal of Climate*, 8(10), 2281-2295.) in order to examine the impact of SST since SSTs could lead the heat waves.

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4) How do you define meso-scale circulation patterns? Do you perform some kind of spatial filtering? Or do you just mean the nearby circulation?

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Interactive comment on Earth Syst. Dynam. Discuss., 6, 2273, 2015.

**ESDD**

6, C855–C857, 2015

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