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Extreme events of 2012, 2013 and 2014 linked to planetary wave resonance

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Quasi-stationary planetary waves of large-amplitude have been linked to the occurrence of many of the most extreme weather events of the past decades in the Northern Hemisphere. This includes the European heat waves of 2003 and 2010 as well as the catastrophic Elbe flooding 2002. A resonance mechanism was proposed to explain the occurrence of large-amplitude planetary waves (Petoukhov et al. 2013) and a recent increase in the frequency of resonance events has been identified (Coumou et al. 2014).

We extend the analysis to more recent extreme weather events. 2012 marked the warmest spring on record in the USA, accompanied by wettest spring in 100 years in the UK and national heat records for the warmest temperature in spring in 13 other European countries; torrential rains and demolishing floods in central and eastern China together with an oppressive heat wave in the USA in June; hottest July on record in the USA simultaneously with the worst flooding in 60 years in eastern China and Japan; unparalleled heat in the USA and destructive floods in China and the Philippines in August; and widespread floods in the UK in September.

2013 saw Central European Flooding in May-early June; trains of persistent heat waves in the USA and China in mid-June; and in the USA, central Europe, and western and eastern China end of June/July; strong floods in central China and Japan in late July/early August; and in north-eastern China and eastern Russia in mid-and late August; a sweltering heat wave in eastern China and Japan in early September; the worst flood in central China in late September/early October.

The obtained results confirm a recent tendency to an increase in the frequency of occurrence of quasi-resonant conditions, favoring the emergence of persistent regional extremes in the NH mid-latitudes (Petoukhov et al, submitted).

In May 2014, the Balkans were hit by a Vb-type cyclone that brought disastrous flooding and severe damage to Bosnia and Herzegovina, Serbia and Croatia. We have analysed this event in some detail and demonstrate a linkage to planetary wave resonance (Stadtherr et al., in revision).

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