

37/2015 | Please note the embargo until 13 July 2015, 16:00 London time!

## **Ocean warming leads to stronger precipitation extremes** Recent event underlines importance of study by German and Russian scientists

**13 July 2015/Kiel.** Due to climate change, not only atmospheric, but also oceanic, temperatures are rising. A study published in the international journal *Nature Geoscience* led by scientists at the GEOMAR Helmholtz Centre for Ocean Research Kiel shows that increases in sea surface temperature can contribute to the development of stronger precipitation events. Their findings are underpinned by flash-flooding in June in the Olympic city of Sochi, Russia.

That the temperatures on our planet are rising is clear. In particular, the increasing emissions of greenhouse gases such as carbon dioxide continue to warm the atmosphere. The effects of global warming on the hydrological cycle, however, are still not fully understood. Particularly uncertain is how the strength of extreme summertime thunderstorms have changed, and how it may change in the future. In coastal regions neighboring warm seas, the sea surface temperature can play a crucial role in the intensity of convective storms. The Black Sea and eastern Mediterranean have warmed by about 2 C since the early 1980s. Russian and German scientists investigated what impact this warming may have had on extreme precipitation in the region.

“Our showcase example was a heavy precipitation event from July 2012 that took place in Krymsk (Russia), near the Black Sea coast, resulting in a catastrophic flash food with 172 deaths”, said Edmund Meredith, lead author of the study. “We carried out a number of very-high-resolution simulations with an atmospheric model to investigate the impact of rising sea surface temperatures on the formation of intense convective storms, which are often associated with extreme rainfall”, Meredith continued. Simulations of the event with observed sea surface temperatures showed an increase in precipitation intensity of over 300%, compared to comparable simulations using sea surface temperatures representative of the early 1980s. “We were able to identify a very distinct change, which demonstrates that convective precipitation responds with a strong, non-linear signal to the temperature forcing”, Prof. Douglas Maraun, co-author of the study added.

At the end of June 2015, the nearby Olympic city of Sochi experienced an unusually intense precipitation event. Over 175 mm of rain was recorded in 12 hours, showing the relevance of the scientists work. “Due to ocean warming, the lower atmosphere has become more unstable over the Black Sea and eastern Mediterranean. We therefore expect that events like those in Krymsk or Sochi will become more frequent in the future”, added the Kiel-based climate scientist.

### **Reference:**

Meredith, E.P., V.A. Semenov, D. Maraun, W. Park, and A.V. Chernokulsky, 2015: Crucial role of Black Sea warming in amplifying the 2012 Krymsk precipitation extreme. *Nature Geoscience*, DOI: 10.1038/NGEO2483

### **Links:**

[www.geomar.de](http://www.geomar.de) GEOMAR Helmholtz Centre for Ocean Research Kiel

Examples from the coverage of the event in 2012 Krymsk

<http://www.theguardian.com/world/2012/jul/08/russia-floods-deaths>

<http://www.nytimes.com/2012/07/08/world/europe/fatal-flooding-in-southern-russia-after-heavy-rain.html>

Examples from the coverage of the Sochi 2015 event

<http://www.bbc.com/news/world-europe-33278251>

<http://www.reuters.com/video/2015/06/27/russias-sochi-hit-by-floods?videoid=364743611>

**Images:**

Images are available for download at [www.geomar.de/n3915](http://www.geomar.de/n3915).

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