FLOOD ACTIVITY IN ASIA

Has global warming lead to intensified flooding in Asia?

SPPI
Science & Public Policy Institute
"science-based policy for a better world"

SPPI & CO2SCIENCE ORIGINAL PAPER ♦ August 15, 2012

FLOOD ACTIVITY IN ASIA

Citation: Center for the Study of Carbon Dioxide and Global Change. "Flood Activity in Asia." Last modified August 15, 2012. http://www.co2science.org/subject/f/summaries/floodsasia.php.

Based on simulations provided by mathematical models, climate alarmists generally predict more frequent and more severe floods in response to global warming. In this summary we examine real-world data relative to this claim as it pertains to Asia.

Beginning with a study that covered the entire continent, Cluis and Laberge (2001)[1] analyzed the flow records of 78 rivers distributed throughout the entire Asia-Pacific region to see if there had been any enhancement of Earth's hydrologic cycle coupled with an increase in variability that might have led to more floods between the mean beginning and end dates of the flow records: 1936 ± 5 years and 1988 ± 1 year, respectively. Over this period, the two scientists determined that *mean* river discharges were *unchanged* in 67% of the cases investigated; and where there were trends, 69% of them were *downward*. In addition, *maximum* river discharges were *unchanged* in 77% of the cases investigated; and where there were trends, 72% of them were *downward*. Consequently, and contrary to climate-alarmist claims of global warming leading to more frequent and more severe flooding, the two researchers observed no changes in both of these flood characteristics in the majority of the rivers they studied; and where there were changes, more of them were of the type that typically leads to *less* flooding and less *severe* floods.

Contrary to climate-alarmist claims of global warming leading to more frequent and more severe flooding, the two researchers observed no changes in both of these flood characteristics in the majority of the rivers they studied; and where there were changes, more of them were of the type that typically leads to less flooding and less severe floods.

Two years later, Kale *et al*. (2003)[2] conducted geomorphic studies of slackwater deposits in the bedrock gorges of the Tapi and Narmada Rivers of central India, which allowed them to assemble long chronologies of large floods of these rivers. In doing so, they found that "since 1727 at least 33 large floods have occurred on the Tapi River and the largest on the river occurred in 1837." With respect to large floods on the Narmada River, they reported at least 9-10 floods between

[1] http://www.co2science.org/articles/V5/N2/C1.php.
[2] http://www.co2science.org/articles/V6/N37/C2.php.

the beginning of the Christian era and AD 400; while between AD 400 and 1000 they documented 6-7 floods, between 1000 and 1400 about 8-9 floods, and after 1950 three more such floods. In addition, on the basis of texture, elevation and thickness of the flood units, they concluded that "the periods AD 400-1000 and post-1950 represent periods of extreme floods."

What do these findings imply about the effects of global warming on central India flood events? The post-1950 period is often claimed by climate alarmists to have been the warmest of the past millennium; and it has indeed experienced some extreme floods. However, the flood characteristics of the AD 400-1000 period are described in equivalent terms; and this was a rather cold climatic interval known as the Dark Ages Cold Period [see, for example, McDermott *et al.* (2001)[3] and Andersson *et al.* (2003)[4]]. In addition, the most extreme flood in the much shorter record of the Tapi River occurred in 1837, near the beginning of one of the colder periods of the Little Ice Age. As such, there appears but little correlation between the flood characteristics of the Tapi and Narmada Rivers of central India and the thermal state of the global climate.

In the case of more extreme hydrologic events, they found that all of the wettest 5-year periods preceded the Industrial Revolution, manifesting themselves at times when the air's carbon dioxide content was largely unaffected by anthropogenic CO_2 emissions.

Focusing on the much smaller area of southwestern Turkey, Touchan *et al.* (2003)[5] developed two reconstructions of spring (May-June) precipitation from tree-ring width measurements, one of them (1776-1998) based on nine chronologies of *Cedrus libani*, *Juniperus excelsa*, *Pinus brutia* and *Pinus nigra*, and the other one (1339-1998) based on three chronologies of *Juniperus excelsa*. These reconstructions, in their words, "show clear evidence of multi-year to decadal variations in spring precipitation," with both wet and dry periods of 1-2 years duration being well distributed throughout the record. However, in the case of more *extreme* hydrologic events, they found that *all* of the wettest 5-year periods *preceded* the Industrial Revolution, manifesting themselves at times when the air's carbon dioxide content was largely unaffected by anthropogenic CO_2 emissions.

Moving north to Russia, in a study of the Upper Volga and Zapadnaya Dvina Rivers, Panin and Nefedov (2010)[6] documented "the geomorphological and altitudinal positions of [human] occupational layers corresponding to 1224 colonization epochs at 870 archaeological sites in river valleys and lake depressions in southwestern Tver province," identifying "a series of

[3] http://www.co2science.org/articles/V4/N50/C1.php.
[4] http://www.co2science.org/articles/V6/N34/C3.php.
[5] http://www.co2science.org/articles/V6/N9/C2.php.
[6] http://www.co2science.org/articles/V13/N29/C2.php.

alternating low-water (low levels of seasonal peaks, many-year periods without inundation of flood plains) and high-water (high spring floods, regular inundation of floodplains) intervals of various hierarchial rank." In doing so, the two researchers report finding that "low-water epochs coincide with epochs of relative warming, while high-water epochs [coincide] with cooling epochs," because "during the climate warming epochs, a decrease in duration and severity of winters should have resulted in a drop in snow cover water equivalent by the snowmelt period, a decrease in water discharge and flood stage, and a decrease in seasonal peaks in lake levels," noting that "a model of past warming epochs can be the warming in the late 20th century, still continuing now." They also report finding that "in the Middle Ages (1.8-0.3 Ky ago), the conditions were favorable for long-time inhabiting [of] river and lake floodplains, *which are subject to inundation nowadays* [italics added]." In addition, their results indicate that of this time interval, the period AD 1000-1300 hosted the greatest number of floodplain occupations.

Interestingly, Panin and Nefedov state that this last period and other "epochs of floodplain occupation by humans in the past can be regarded as hydrological analogues of the situation of the late 20th-early current century," which they say "is forming under the effect of directed climate change." And this relationship clearly implies that the current level of warmth in the portion of Russia that hosts the Upper Volga and Zapadnaya Dvina Rivers is not yet as great as it was during the AD 1000-1300 portion of the Medieval Warm Period.

Their results indicate that of this time interval, the period AD 1000-1300 hosted the greatest number of floodplain occupations.

In another paper, Davi *et al.* (2006)[7] developed a reconstruction of streamflow that extended from 1637 to 1997, based on absolutely dated tree-ring-width chronologies from five sampling sites in west-central Mongolia, all of which sites were in or near the Selenge River basin, the largest river in Mongolia. Of the ten wettest five-year periods, only two occurred during the 20th century (1990-1994 and 1917-1921, the second and eighth wettest of the ten extreme periods, respectively), once again indicative of a propensity for *less* flooding during the *warmest* portion of the 360-year period.

Moving to the most populous country in Asia, Jiang *et al.* (2005)[8] analyzed pertinent historical documents to produce a 1000-year time series of flood and drought occurrence in the Yangtze Delta of Eastern China (30 to 33°N, 119 to 122°E), which with a nearly-level plain that averages only two to seven meters above sea level across 75% of its area is vulnerable to flooding and maritime tidal hazards. This work demonstrated that alternating wet and dry episodes occurred throughout the 1000-year period, with the most rapid and strongest of these fluctuations occurring during the *Little Ice Age* (1500-1850).

---

[7] http://www.co2science.org/articles/V9/N30/C2.php.
[8] http://www.co2science.org/articles/V9/N3/C1.php.

Two years later in a separate study of the Yangtze Delta Zhang *et al*. (2007)[9] also developed flood and drought histories of the past thousand years "from local chronicles, old and very comprehensive encyclopaedia, historic agricultural registers, and official weather reports," after which "continuous wavelet transform was applied to detect the periodicity and variability of the flood/drought series" and, finally, the results of the entire set of operations were compared with 1000-year temperature histories of northeastern Tibet and southern Tibet. This work revealed, in the words of the researchers, that "colder mean temperature in the Tibetan Plateau usually resulted in higher probability of flood events in the Yangtze Delta region," and they say that "during AD 1400-1700 [the coldest portion of their record, corresponding to much of the Little Ice Age], the proxy indicators showing the annual temperature experienced larger variability (larger standard deviation), and this time interval *exactly* [italics added] corresponds to the time when the higher and significant wavelet variance occurred." In contrast, they report that "during AD 1000-1400 [the warmest portion of their record, corresponding to much of the Medieval Warm Period], relatively stable changes of climatic changes reconstructed from proxy indicators in Tibet correspond to lower wavelet variance of flood/drought series in the Yangtze Delta region."

> This work demonstrated that alternating wet and dry episodes occurred throughout the 1000-year period, with the most rapid and strongest of these fluctuations occurring during the Little Ice Age (1500-1850).

In still another study focusing on the Yangtze Delta, Zhang *et al*. (2009)[10] utilized wavelet analysis on the decadal locust abundance data of Ma (1958) for the AD 950s-1950s, the decadal Yangtze Delta flood and drought frequency data of Jiang *et al*. (2005) for the AD 1000s-1950s, and the decadal mean temperature records of Yang *et al*. (2002) for the AD 950s-1950s, "to shed new light on the causal relationships between locust abundance, floods, droughts and temperature in ancient China." In doing so, the international team of Chinese, French, German and Norwegian researchers found that coolings of 160-170-year intervals dominated climatic variability in China over the past millennium, and that these cooling periods promoted locust plagues by enhancing temperature-associated drought/flood events. As a result, the six scientists say that "global warming might not only imply reduced locust plague[s], but also reduced risk of droughts and floods for entire China," noting that these findings "challenge the popular view that global warming necessarily accelerates natural and biological disasters such as drought/flood events and outbreaks of pest insects," as promulgated by the most recent report of the Intergovernmental Panel on Climate Change. Indeed, they say their results are an example of "benign effects of global warming on the regional risk of natural disasters."

[9] http://www.co2science.org/articles/V11/N18/C3.php.
[10] http://www.co2science.org/articles/V12/N21/B2.php.

In a final study from China, but focusing on the headwater region of the Sushui River within the Yuncheng Basin in the southeast part of the middle reaches of China's Yellow River, Huang *et al.* (2007)[11] constructed a complete catalog of Holocene *overbank flooding events* at a watershed scale, based on pedo-sedimentary records of the region's semiarid piedmont alluvial plains, including the color, texture and structure of the sediment profiles, along with determinations of particle-size distributions, magnetic susceptibilities and elemental concentrations. This work revealed there were six major episodes of overbank flooding. The first occurred at the onset of the Holocene, the second immediately *before* the mid-Holocene Climatic Optimum, and the third in the *late stage* of the mid-Holocene Climatic Optimum, while the last three episodes coincided with "the cold-dry stages during the late Holocene," according to the six scientists. Speaking of the last of the overbank flooding episodes, they note that it "corresponds with the well documented 'Little Ice Age,' when "climate departed from its long-term average conditions and was unstable, irregular, and disastrous," which is pretty much like the Little Ice Age has been described in many other parts of the world as well.

In light of the findings of these several Asian studies, it is clear they provide *no support whatever* for the climate-alarmist claim that global warming leads to more frequent and severe flooding. If anything, they tend to suggest just the *opposite*.

REFERENCES

Andersson, C., Risebrobakken, B., Jansen, E. and Dahl, S.O. 2003. Late Holocene surface ocean conditions of the Norwegian Sea (Voring Plateau). *Paleoceanography* **18**: 10.1029/2001PA000654.

Cluis, D. and Laberge, C. 2001. Climate change and trend detection in selected rivers within the Asia-Pacific region. *Water International* **26**: 411-424.

Davi, N.K., Jacoby, G.C., Curtis, A.E. and Baatarbileg, N. 2006. Extension of drought records for central Asia using tree rings: West-Central Mongolia. *Journal of Climate* **19**: 288-299.

Gong, G.-C., Liu, K.-K., Chiang, K.-P., Hsiung, T.-M., Chang, J., Chen, C.-C., Hung, C.-C., Chou, W.-C., Chung, C.-C., Chen, H.-Y., Shiah, F.K., Tsai, A.-Y., Hsieh, C.-h., Shiao, J.-C., Tseng, C.-M., Hsu, S.-C., Lee, H.-J., Lee, M.-A., Lin, I-I and Tsai, F. 2011. Yangtze River floods enhance coastal ocean phytoplankton biomass and potential fish production. *Geophysical Research Letters* **38**: 10.1029/2011GL047519.

Huang, C.C., Pang, J., Zha, X., Su, H., Jia, Y. and Zhu, Y. 2007. Impact of monsoonal climatic change on Holocene overbank flooding along Sushui River, middle reach of the Yellow River, China. *Quaternary Science Reviews* **26**: 2247-2264.

Jiang, T., Zhang, Q., Blender, R. and Fraedrich, K. 2005. Yangtze Delta floods and droughts of the last millennium: Abrupt changes and long term memory. *Theoretical and Applied Climatology* **82**: 131-141.

[11] http://www.co2science.org/articles/V11/N16/C1.php.

Kale, V.S., Mishra, S. and Baker, V.R. 2003. Sedimentary records of palaeofloods in the bedrock gorges of the Tapi and Narmada rivers, central India. *Current Science* **84**: 1072-1079.

Kim, D.-W., Byun, H.-R. and Choi, K.-S. 2009. Evaluation, modification, and application of the Effective Drought Index to 200-Year drought climatology of Seoul, Korea. *Journal of Hydrology* **378**: 1-12.

Ma, S. 1958. The population dynamics of the oriental migratory locust (*Locusta migratoria manilensis* Meyen) in China. *Acta Entomologica Sinica* **8**: 1-40.

McDermott, F., Mattey, D.P. and Hawkesworth, C. 2001. Centennial-scale Holocene climate variability revealed by a high-resolution speleothem 18O record from SW Ireland. *Science* **294**: 1328-1331.

Panin, A.V. and Nefedov, V.S. 2010. Analysis of variations in the regime of rivers and lakes in the Upper Volga and Upper Zapadnaya Dvina based on archaeological-geomorphological data. *Water Resources* **37**: 16-32.

Touchan, R., Garfin, G.M., Meko, D.M., Funkhouser, G., Erkan, N., Hughes, M.K. and Wallin, B.S. 2003. Preliminary reconstructions of spring precipitation in southwestern Turkey from tree-ring width. *International Journal of Climatology* **23**: 157-171.

Yang, B., Brauning, A., Johnson, K.R. and Yafeng, S. 2002. Temperature variation in China during the last two millennia. *Geophysical Research Letters* **29**: 10.1029/2001GL014485.

Zhang, Z., Cazelles, B., Tian, H., Stige, L.C., Brauning, A. and Stenseth, N.C. 2009. Periodic temperature-associated drought/flood drives locust plagues in China. *Proceedings of the Royal Society B* **276**: 823-831.

Zhang, Q., Chen, J. and Becker, S. 2007. Flood/drought change of last millennium in the Yangtze Delta and its possible connections with Tibetan climatic changes. *Global and Planetary Change* **57**: 213-221.

Cover photo of Tone River gorge in Japan
provided by Microsoft.