

## **Record-Breaking Increase in Taiwan Typhoon Rainfall in the 21<sup>st</sup> Century (updated)**

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Since the beginning of the 21st century Taiwan has experienced a dramatic increase in typhoon-related rainfall. Some investigators suggested that they are the manifestation of global warming effects. However, an analysis of typhoon rainfall intensity with respect to typhoon tracks in different landfall phases relative to the Central Mountain Range indicates this is unlikely the cause. Rather, most of the recently observed large increase in typhoon rainfall in the pre-landing and overland phases is the result of slower moving tropical cyclones (TCs) and their tracks relative to the high mountains. A positive feedback mechanism in which the convective heating pattern forced by topography acts to slow down the TC motion, which is most efficient for the slower-moving northern-track storms. Another factor contributing to increased TC-related rainfall is the interaction between the typhoon circulation and southwest monsoon. When the data analyzed ends in 2011, this factor is most important after the typhoon center exits Taiwan and led to the increase of both typhoon rainfall intensity and rainfall amount in the new century. When the data coverage is extended to 2014, the effects become even more prominent as the increasing rainfall due to monsoon is evident when the typhoon center is still over land. Both the slower TC motion and the increased monsoon induced rainfall are consistent with the recently observed multidecadal trend of intensifying subtropical monsoon and tropical circulations, which is contrary to some theoretical and model projections of global warming.