

**Asian Monsoon Years (2007-2012): Impact of cold surges of the winter monsoon on tropical cyclone activity over the Asian monsoon region**Hiroshi Takahashi<sup>†</sup>; Yoshiki Fukutomi; Jun Matsumoto<sup>†</sup> Japan Agency for Marine-Earth Science and Technology, JapanLeading author: [hiroshi3@jamstec.go.jp](mailto:hiroshi3@jamstec.go.jp)

The impact of northerly surges of the East Asian winter monsoon on tropical cyclogenesis over the eastern Indian Ocean and maritime continent was examined for the 6-month period of October to March from 1979/1980 to 2006/2007 based on case studies and lag-composite analysis. We focused on long-lasting northerly surge events at 6- to 30-day (sub-monthly or intraseasonal) time scales over the South China Sea. In addition, we examined seasonal differences in the impact of northerly surges over the South China Sea on tropical atmospheric circulation. The results show that northerly surges occur frequently in the period from October to March. Long-lasting northerly surges over the South China Sea intrude into tropical regions. Over the eastern Indian Ocean and maritime continent, the surges are associated with the appearance of tropical cyclones. However, the impact of these surges varies with the seasonal march. In October and November, tropical cyclones occur over the South China Sea during the northerly surge events, enhancing positive vorticity over the South China Sea. A cyclone pair symmetric with respect to the equator also appears over the eastern Indian Ocean in November and is responsible for the enhancement of the horizontal gradient of zonal wind by the northerly surge. In contrast, in December, January, and February, an asymmetric cyclone pair (the so-called Borneo vortex) develops around Borneo. The asymmetric cyclone pair around the maritime continent is associated with intensification of low-level wind along a channel between the islands of Borneo, Sumatra, and Java. In March, no clear tropical cyclone appears over the tropical regions in association with the northerly surge. The seasonal difference in the impact of the long-lasting northerly surge of the East Asian monsoon on tropical cyclone development is associated with the background conditions of low-level atmospheric circulation over the eastern Indian Ocean and maritime continent. During November, cyclonic vorticity occurs in the lower troposphere over the eastern Indian Ocean, which is favorable for the development of the cyclone pairs. That is, the superposition of the northerly surges and mean fields produces a highly favorable condition for tropical cyclogenesis. In the other months, the horizontal structures of low-level zonal wind differ from those in November. During December, January, and February, a climatological northerly wind extends over the channel between Borneo and Sumatra, aiding in the deep intrusion of northerly surges into the equatorial region. Flow along this channel is also strongly affected by the land-sea distribution and orography.