海洋大陸西部における対流活動が大規模場に及ぼす影響：YMCスマトラ集中観測期間の数値シミュレーション

Effects of the local convection over the western Maritime Continent on the large-scale: numerical study during the YMC Sumatra campaigns

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The effects of the high-frequency variability on the large-scale, including the intraseasonal oscillation (ISO), over the western Maritime Continent (MC), was quantified using the global nonhydrostatic simulation datasets that marginally resolve mesoscale convective systems. Moisture transport during the Years of the Maritime Continent (YMC) winter field campaigns in 2015 and in 2017 were analyzed, focusing on the land-ocean contrast and their relationship with the ISO events.

The period-mean profiles indicate moistening by low-frequency upward motion in the deep troposphere and drying (moistening) in the lower (middle and upper) troposphere by high-frequency variability. The advection over ocean was greater in 2017 than in 2015, with the opposite occurring over land with smaller interannual differences. These can be related to the longer preconditioning period (rapid transition from the preconditioning to the active, and decaying phases) for the 2015 (2017) case, as well as the relatively suppressed (enhanced) upward motion over ocean under the strong El Niño (moderate La Niña) conditions during 2015 (2017).

The dependence of the land-ocean contrast on the ISO life cycle was more significant in 2015 than in 2017. In the 2015 simulation, moistening over land preceded the major convective period of the ISO, whereas that over ocean preceded the ISO convection not longer than 1 week, consistent with the arguments by previous studies based on precipitation observations. In this case, a nearly in-phase relationship between the moisture advection by high-frequency variability and by low-frequency variability was found over land. In the 2017 case, the land-ocean contrast was weak in low-frequency advection. The relationship between moisture advection by high-frequency variability and by low-frequency variability was indistinct over land, whereas clear relationship was seen over ocean: the high-frequency variability induced lower to middle tropospheric moistening (enhanced upward transport of moisture) during the preconditioning (active) phases of the ISO convection, in common with the 2015 case. These results highlight clear land-ocean contrasts in sensitivity of local convection to background states and its link with the ISO life cycle.

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