

Numerical simulation of a local wind, Hijikawa-Arashi, by use of JMANHM

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"Hijikawa-Arashi" is one of the most famous local wind in Japan and occasionally observed at the estuary of Hijikawa River in Ehime prefecture in the morning of the autumn and winter seasons. A land breeze of a cold air formed in the night in the Ozu basin, which locates upstream of the Hijikawa River, flows thorough a very narrow valley whose width is several hundreds meters. This flow may cause a hydraulic jump accompanying a strong surface wind near the estuary in the downstream of the valley.

This study conducts fine resolution numerical simulation by means of a regional weather prediction model, Japan Meteorological Agency's Non-Hydrostatic Model (JMANHM), which include realistic topography and cloud physics, and so on, to simulate several real cases of Hijikawa-Arashi. The Meso-Analysis provided by JMA (MANL) is used for initial and boundary conditions.

When horizontal resolution is 400 m that can vaguely represent topography of the valley and basin while vertical resolution is 40 m, the moderately strong winds (~10 m/s) occur near the estuary, but the fog do no form at all in the basin. If the vertical resolution is improved to be 10 m, the model does form a radiation fog in the night. Due to the longwave radiation, the air in the basin become further cool by 5 K, and stronger surface winds near the estuary occur. Furthermore, we increase horizontal resolution up to 80 m. In the fine resolution run can simulate the realistic Hijikawa-Arashi: strong winds near the estuary accompany the fog formed in the basin.

A vertical cross-section along with Hijikawa River is analyzed, and we do see characteristics of the hydraulic jump in the downstream of the narrow valley. We will also compare with available aerial videos and surface observations of wind speeds at the estuary for one of the simulated case.

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