

## Comments on "Numerical Simulation of the Life Cycle of Tropical Cyclones"

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In a recent outstanding paper, Ooyama (1969) described the most realistic numerical model of a tropical cyclone so far devised. Resemblance between the model and nature is particularly close during the later stages of hurricane development and during the mature stage. However, in the early stages of development discrepancies are serious.

Although measurements are seldom made in weak disturbances, the time required for a  $5 \text{ m sec}^{-1}$  circulation to develop into a typhoon is almost always less

than 100 hr, compared with more than 500 hr for the model.

In Ooyama's Case A the central pressure fell *the first 20 mb* in 84 hr; the time taken by seven 1965 typhoons ranged from 5–60 hr (median 31) as shown in Fig. 1.

In Ooyama's Case A the central pressure fell *the second 20 mb* in 25 hr; the time taken by the seven typhoons ranged from 6–47 hr (median 25).

Although "a cooperative process between the

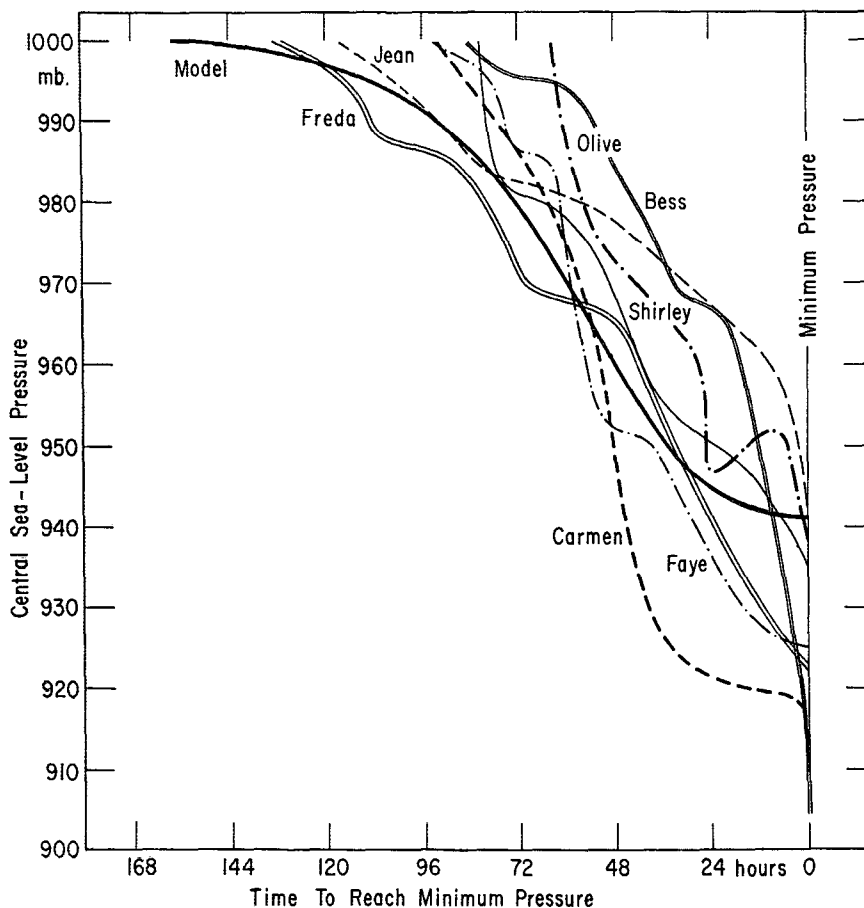


FIG. 1. Rate of central surface pressure falls in 1) Ooyama's (1969) model tropical cyclone (from his Fig. 4), the heavy full line; and 2) seven disturbances which developed into intense typhoons over the western Pacific during 1965 (Fleet Weather Central/Joint Typhoon Warning Center, 1965). When central pressure falls to about 1000 mb in this region, winds reach about  $10 \text{ m sec}^{-1}$  (Ooyama's initial condition).

cumulus-scale moist convection and the cyclone-scale circulation," as formulated by the model, fits the observations very well *after* the central pressure has fallen 20 mb, it accounts neither for the speed of initial 20-mb fall nor for the rarity of this event.

#### REFERENCES

- Fleet Weather Central/Joint Typhoon Warning Center, 1965: Annual typhoon report, 1965. Guam, Marianas Islands, 258 pp.  
 Ooyama, K., 1969: Numerical simulation of the life cycle of tropical cyclones. *J. Atmos. Sci.*, **26**, 3-40.