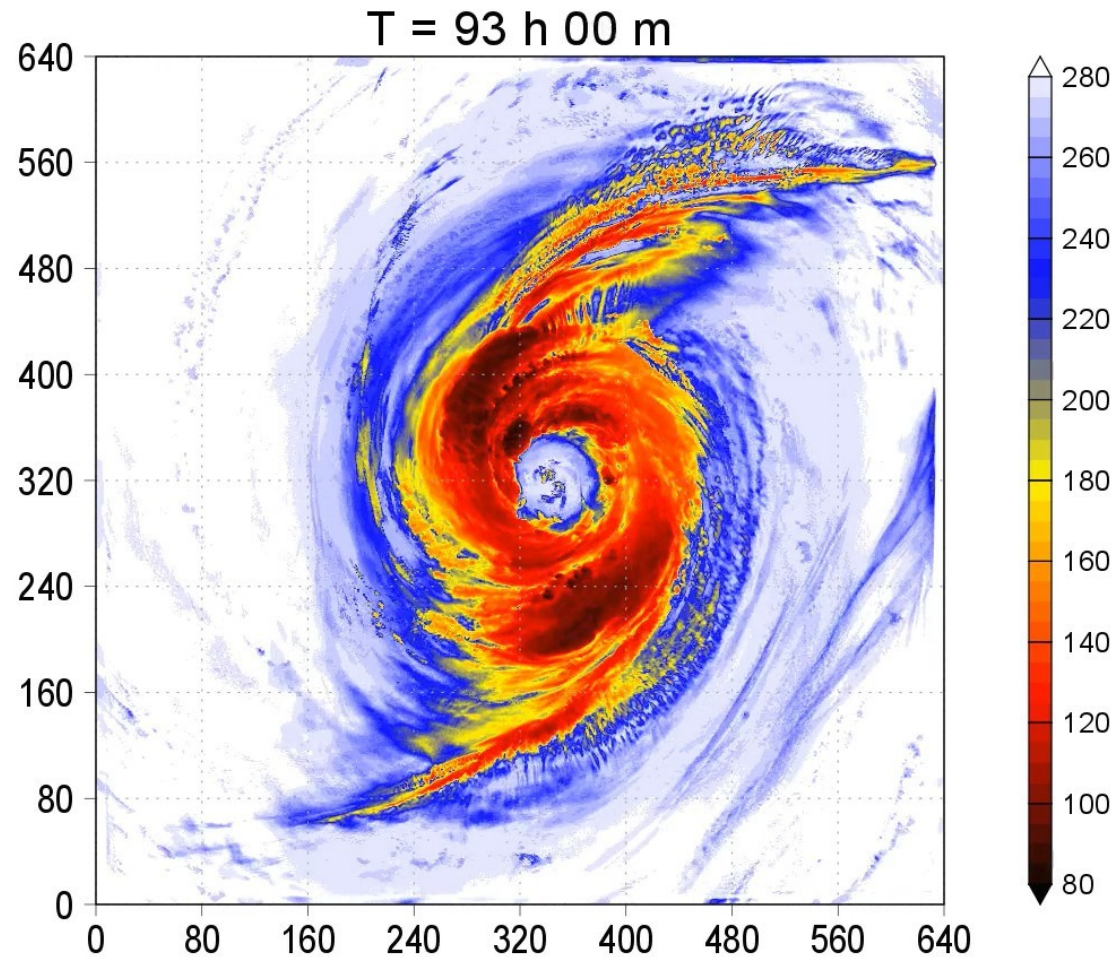


# What is needed to make a ~~perfect~~ prediction of a typhoon?

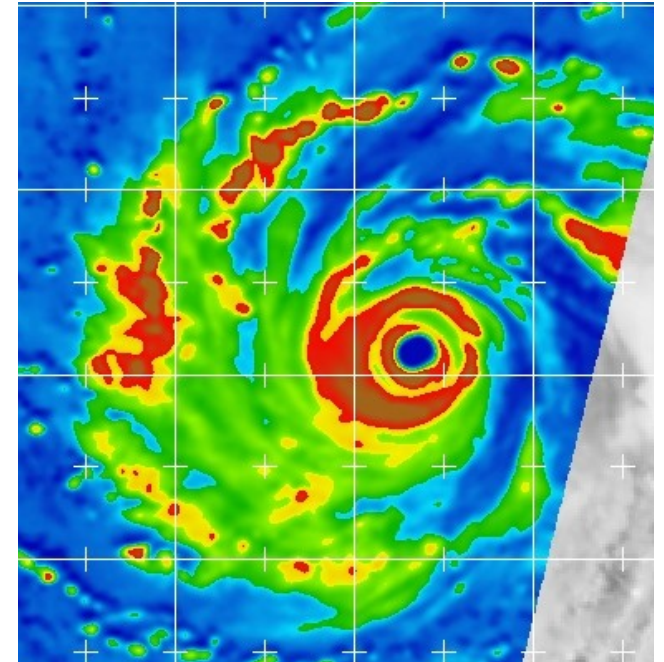


Wei-Ting Fang, Min-Ken Hsieh,

Takahiro Ishiyama, **Kazuya Yamazaki**, Shinichi Kodama

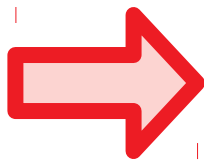
# More observations

- More microwave satellites
  - ➔ Frequent images of the inner core
- Direct aircraft observation



Dozens of eyewall penetrations per hurricane!

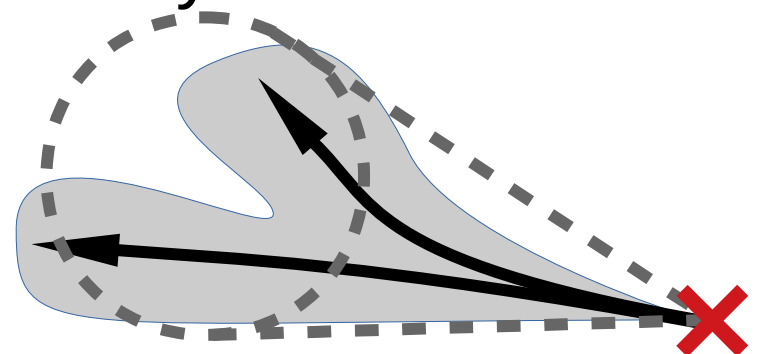
Even the U.S. hasn't achieved perfect TC predictions.



Those are not sufficient!

# Model, DA, Products, ...

- Advanced data assimilation (DA)
  - Good use of existing observations
    - ✓ Atmospheric motion vectors
    - ✓ Ground-based radars
    - ✓ Surface observations
- Sophisticated and high-res models
  - Resolving the inner structure
- User-friendly products with uncertainty information
  - ✓ Bimodal scenarios etc.



A black and white photograph of a planetary surface, likely Mars, showing a large, circular impact crater. The crater has a distinct rim and a central peak. The surrounding terrain is rugged and covered in smaller craters. A semi-transparent rectangular box is overlaid on the upper portion of the image, containing the text "We need everything!".

**We need everything!**