

# 雷達都卜勒速度場反折錯與異常值濾除技術發展

方偉庭 張保亮

中央氣象署

2024.09.04

天氣分析與預報研討會@CWA

# Wind-induced antenna oscillation Typhoon Goni (2015)

Central Weather Administration



Oscillations on Radar Observations and Its Mitigation. Wea. Forecasting, 35, 2235-2254.

# Wind-induced antenna oscillation Typhoon Goni (2015)

Central Weather Administration



Oscillations on Radar Observations and Its Mitigation. *Wea. Forecasting*, **35**, 2235-2254.

### Beam propagation with fixed elevation







## Beam propagation with oscillating elevation







### Two-step curve fitting approach



## Iterative curve fitting dealiasing algorithm (ICFD)





-60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 RF



The flagged data undergo dealiasing as the initial step, rather than direct removal.

7

# Iterative surface fitting dealiasing algorithm (ISFD)

Central Weather Administration



#### Constraint:

- Features in radial direction are not easy to be included. (Radial average)
- Continuity check sometimes spreads the error to adjacent radius.
- More complicated design
- Increasing execution time

## Flowchart of ISFD

Central Weather Administration



#### Operation: Zhang and Wang (2005)



## Better recovery for eyewall convection asymmetric case RCKT



# Noise mitigation RCGI



# Quantitative validation Four typhoon cases



12

### Successful rate

	Operation	ISFD
Doksuri (10308)	84.5%	97.4%
Saola (8864)	84.1%	100%
Haiku (16223)	87.0%	98.7%
Koinu (19135)	80.3%	98.4%

#### (): Total sweep number

10/0

Successful: The number of sweeps with aliased data covering an area less than 200 km<sup>2</sup>.





 The iterative surface fitting dealiasing (ISFD) algorithm based on FFT technique, which is an extension of Chang et al. (2020), aims to develop a method that can recover aliased Doppler velocities and filter out noise data resulting from dual-PRF.

Summary

- Compared to iterative curvre fitting dealiasing (ICFD) algorithm, ISFD possesses several advantages: 1) it can more effectively incorporate radar data radial variability information, 2) it features a simplified procedure design, and 3) it is less susceptible to the influence of discontinuous data distributions.
- Compared to the operational dealiasing method ZW05, which maintains accuracy above 80%, ISFDA achieves accuracy exceeding 97%, demonstrating that ISFDA significantly outperforms current operational methods in typhoon cases and exhibits potential for real-time operational applications.



# Wind-induced antenna oscillation Typhoon Haitang (2005)

Central Weather Administration



### 2005-0717-2236 UTC 0.50PPI



15

### Fourier analyses



VAD analyses

