Quality control of weather radar data by using dual-polarization

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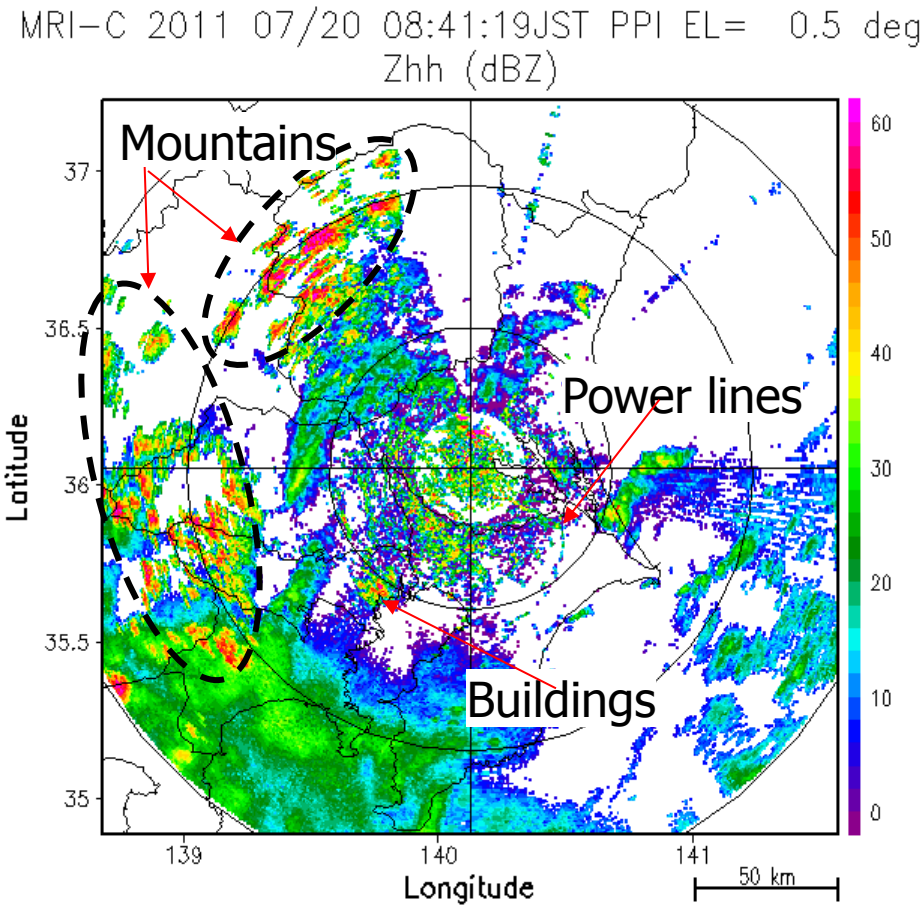
Contents

- Ground clutter removal
- Sea clutter removal
- Clear air echo removal
- JMA’s practical case

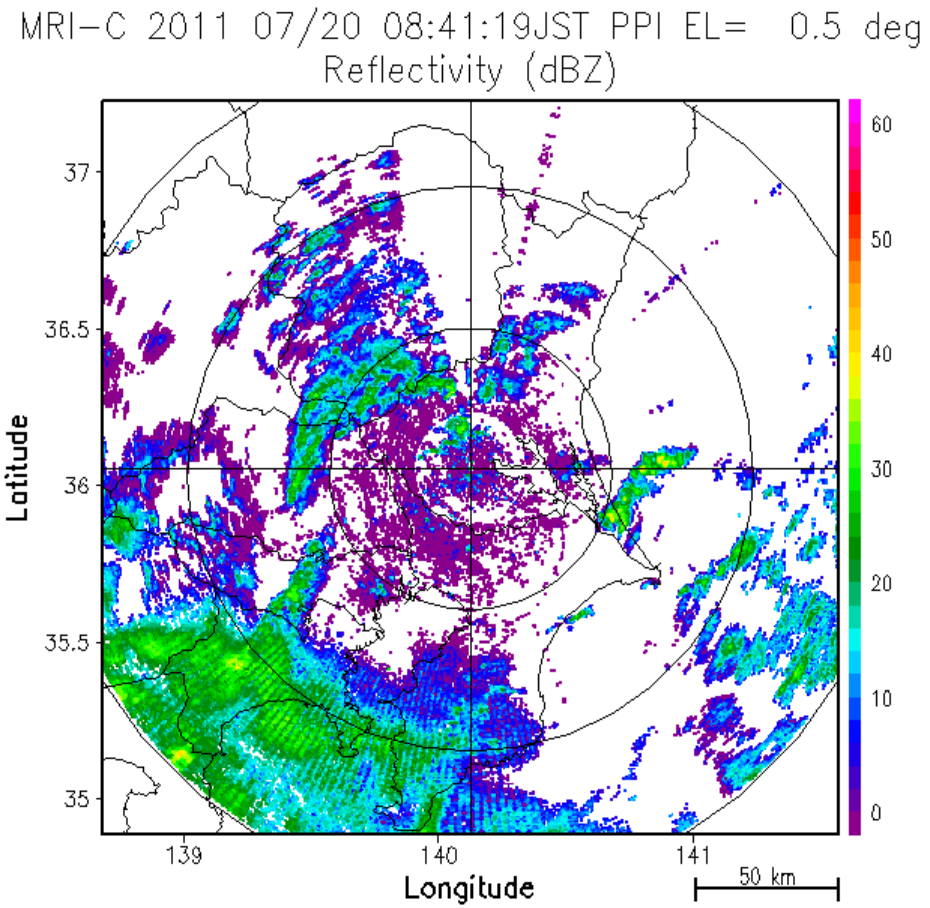
Removal of ground clutter (GC)

- MTI filter cannot fully remove GC
- MTI filter may degrade data.

Normal

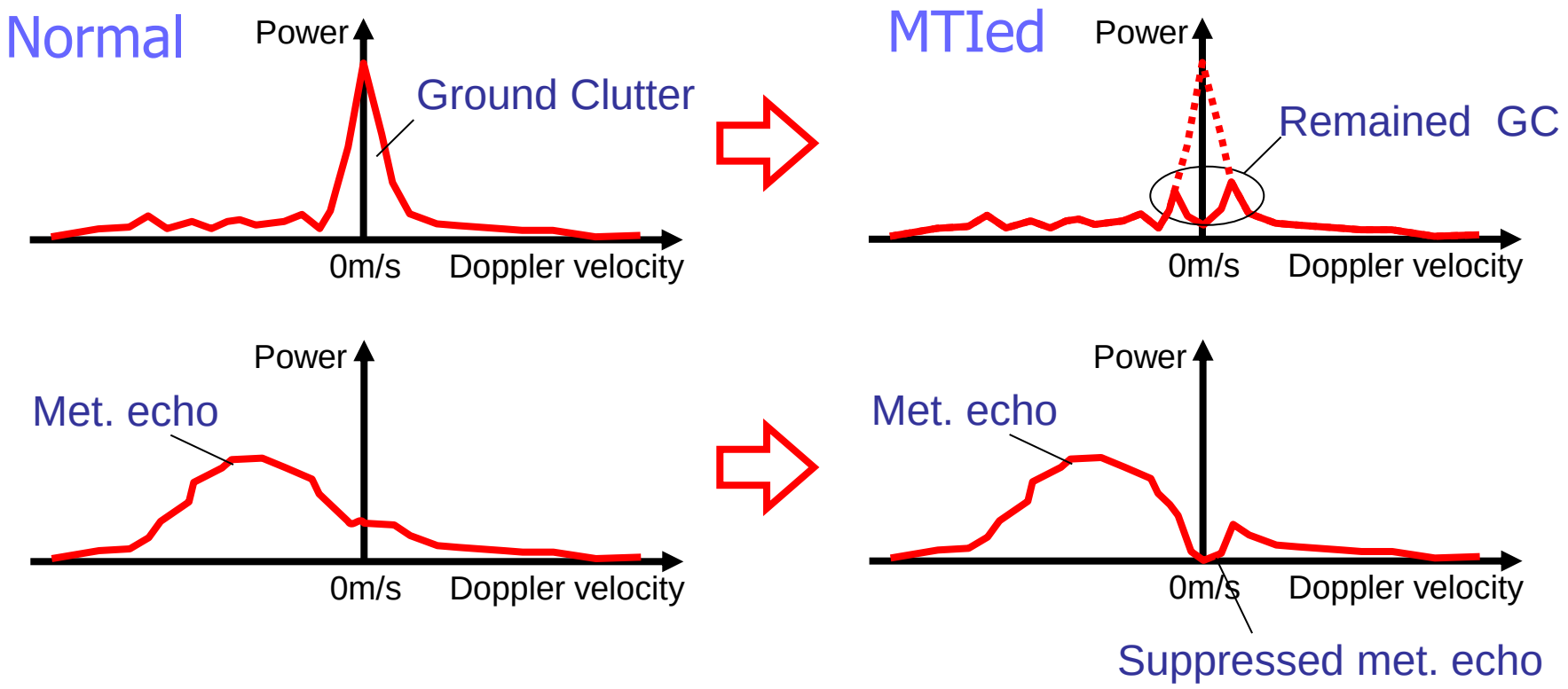


MTIed



Clutter removal (MTI filter)

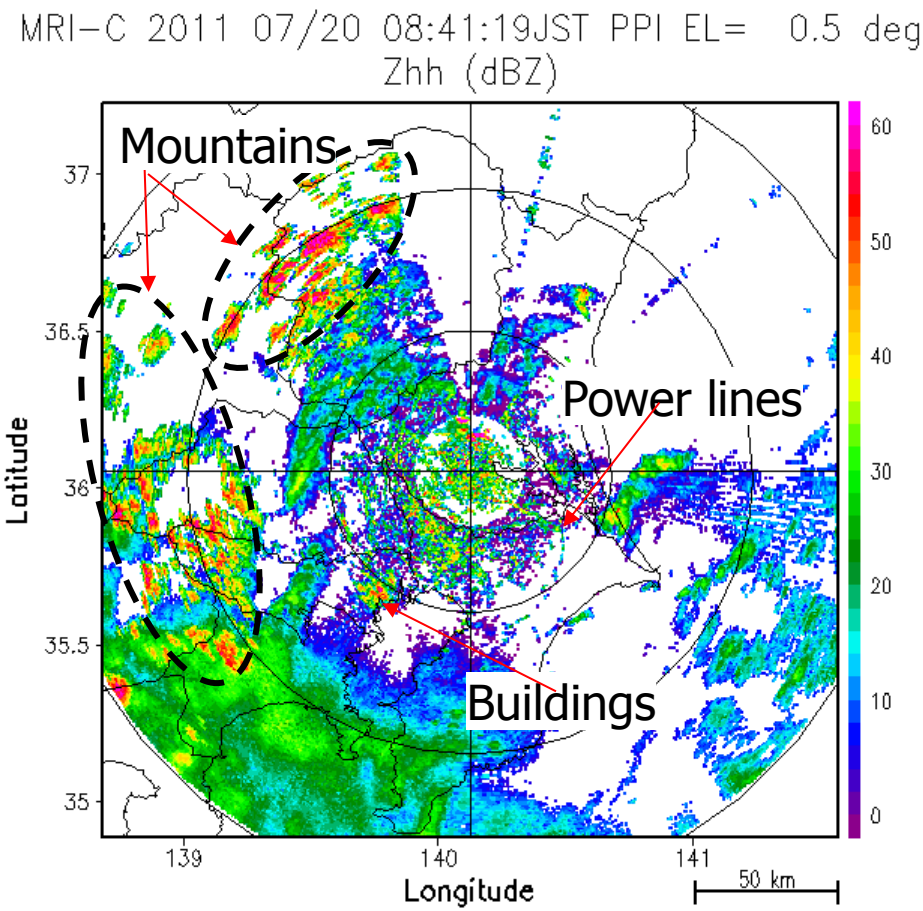
- MTI filter : moving target indication (MTI) is one of the method to mitigate the clutter and identify moving targets
- It removes and interpolates the power component around 0 m/s in velocity-power space (periodogram)



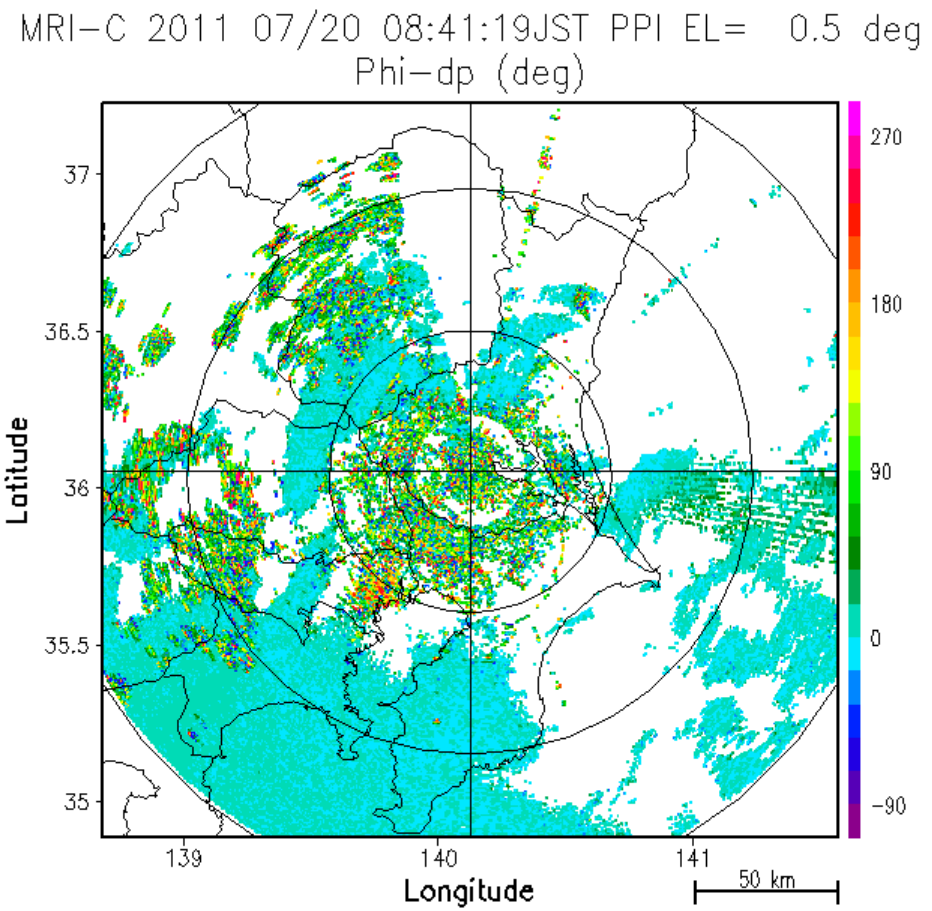
Removal of ground clutter (GC)

- Φ_{DP} is spatially fluctuating in ground clutter regions.
- Φ_{DP} is spatially smooth in precipitation echo.

Z

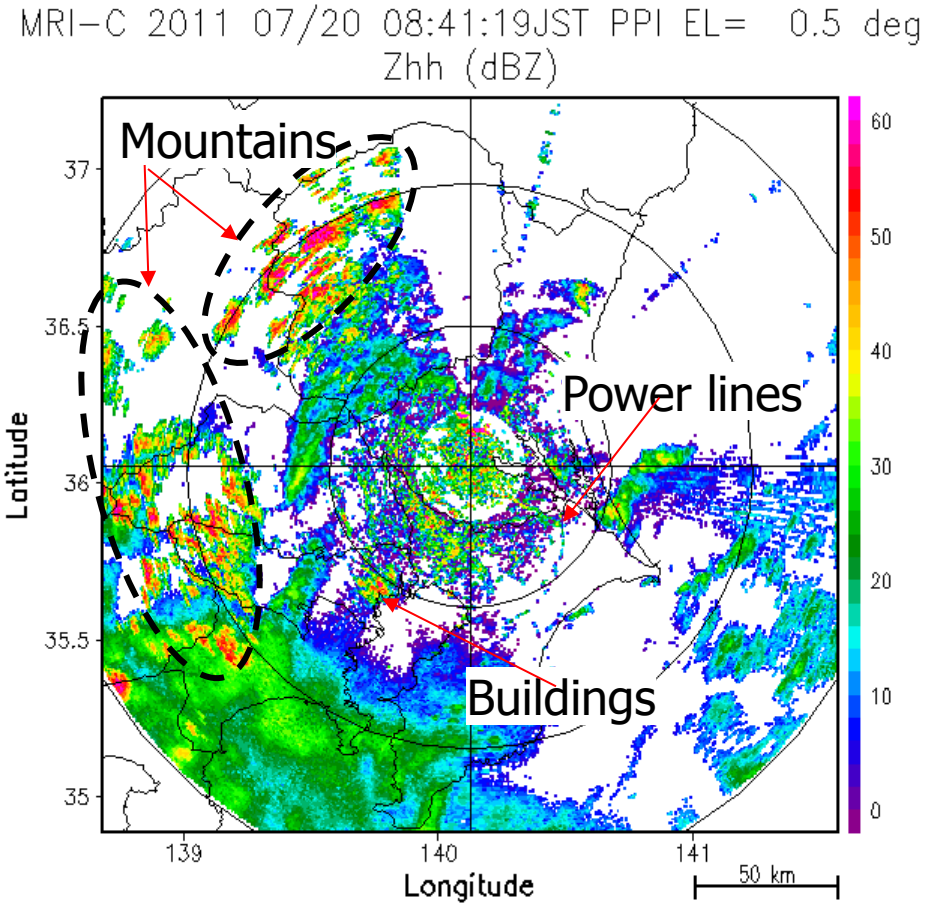


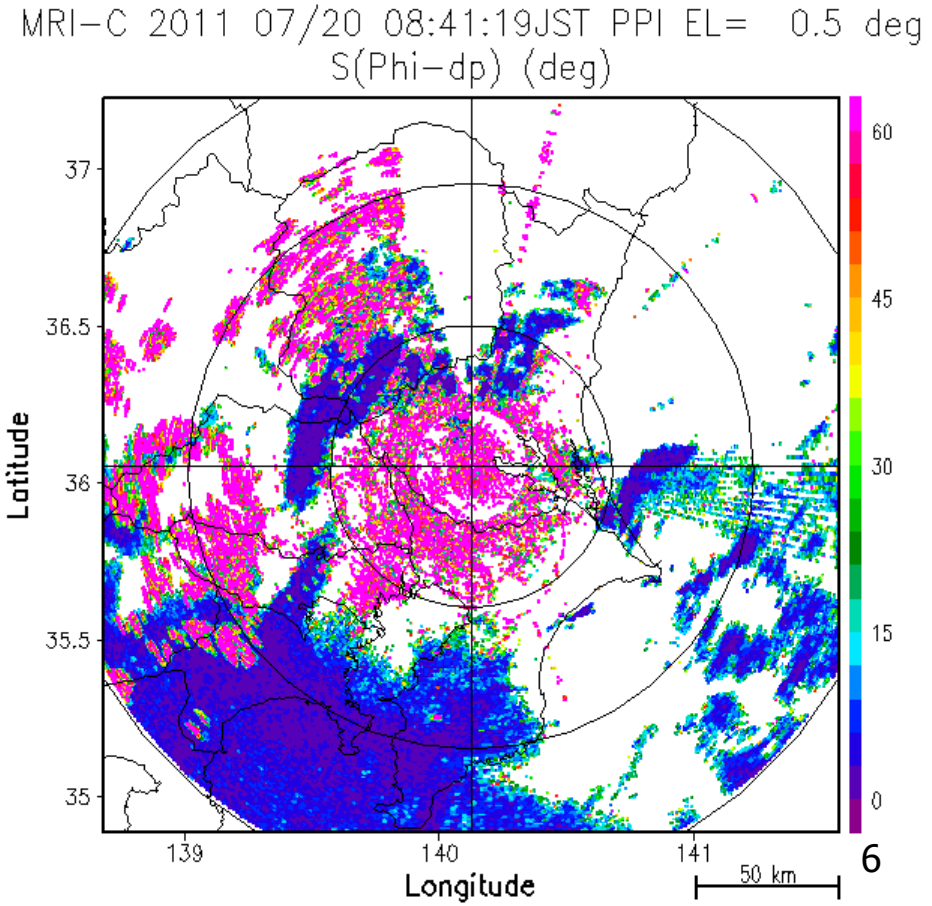
Φdp



Removal of ground clutter (GC)

- GC can be efficiently identified and removed using standard deviation of Φ_{DP}.





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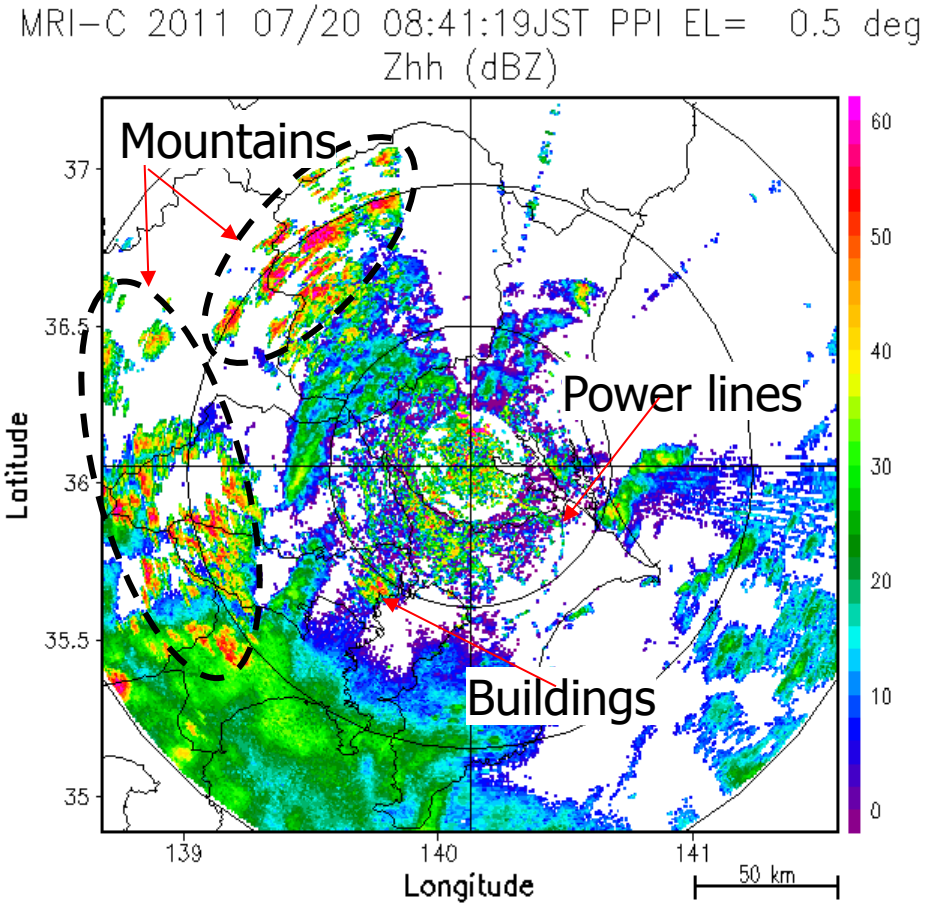

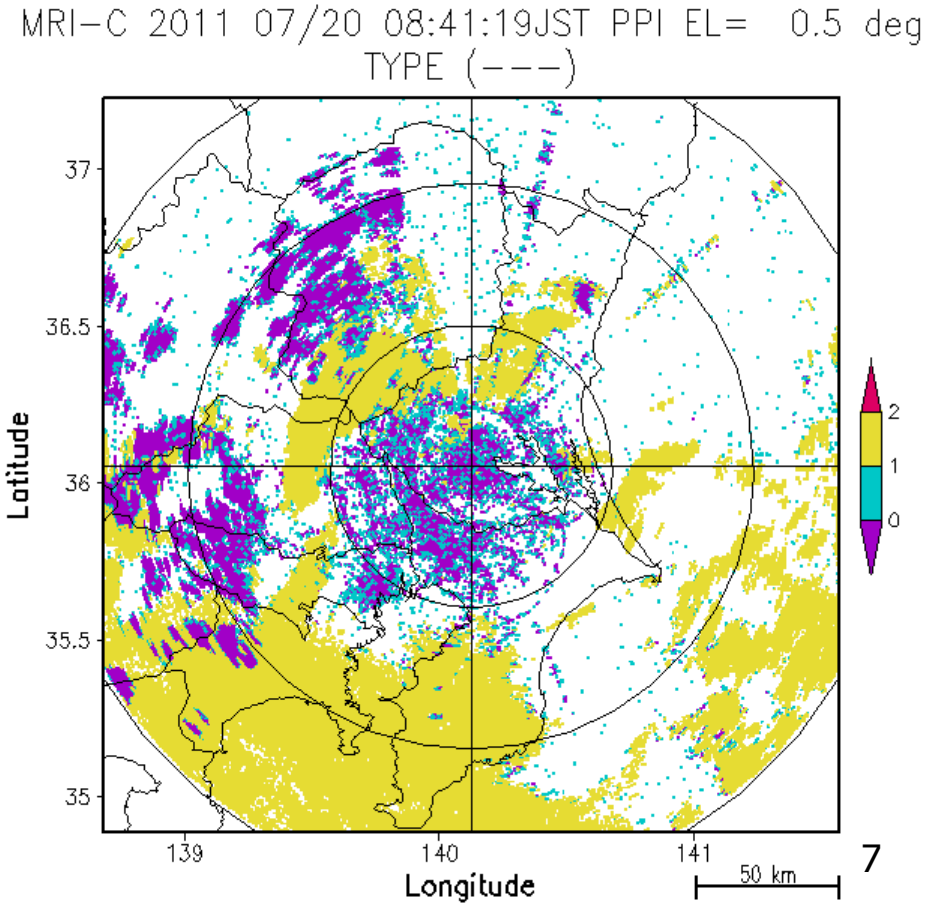

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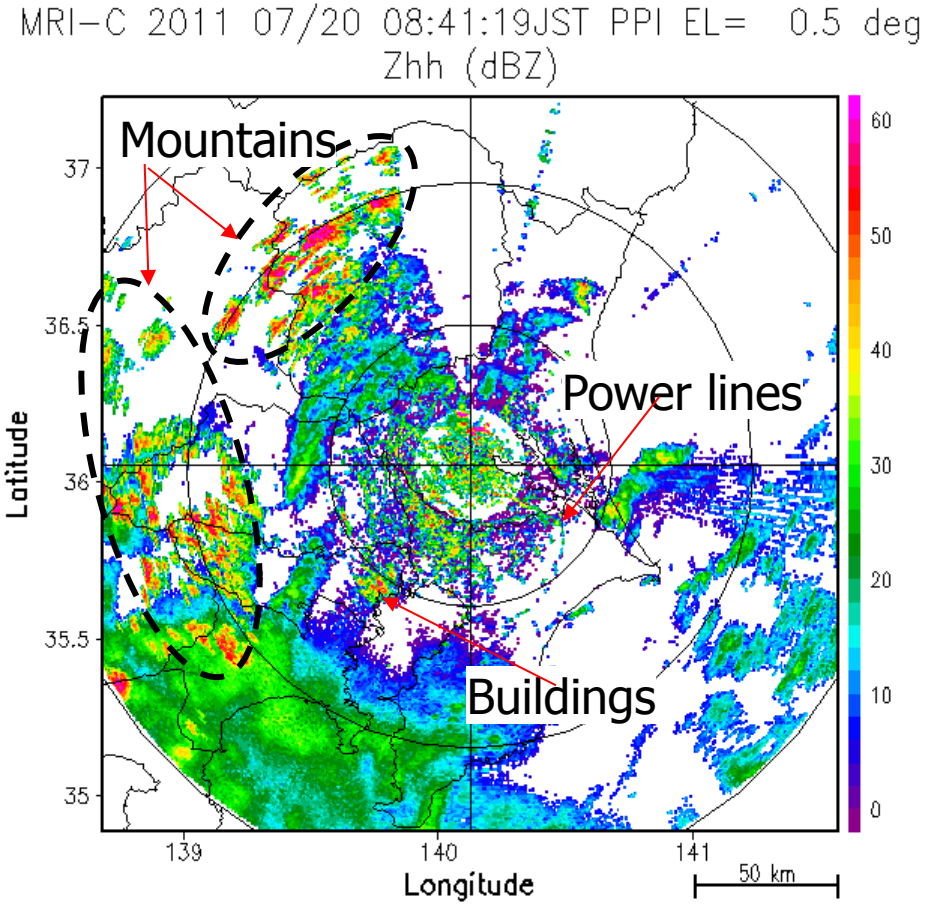
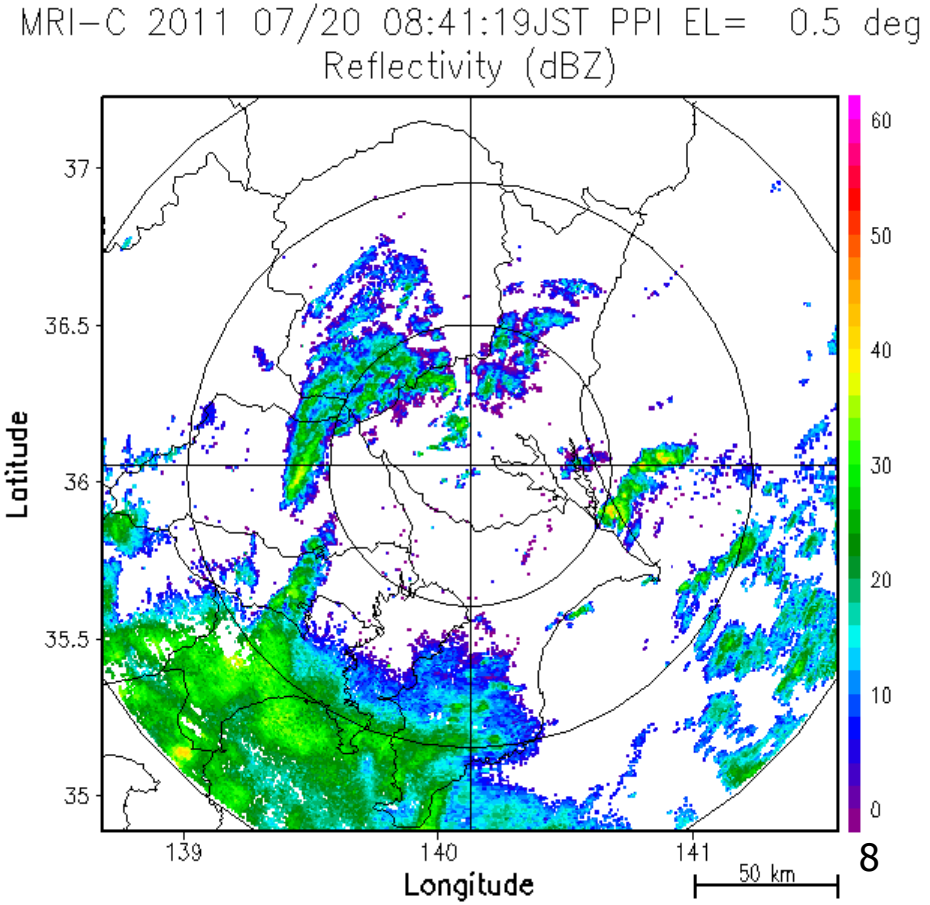
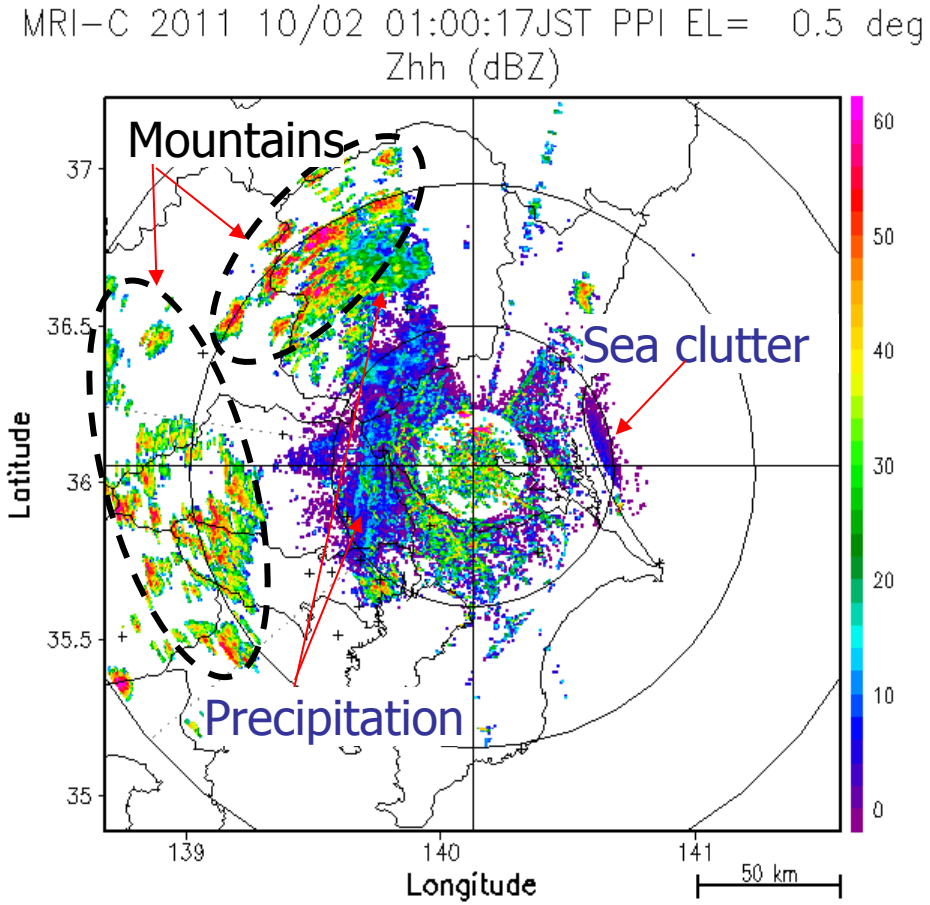
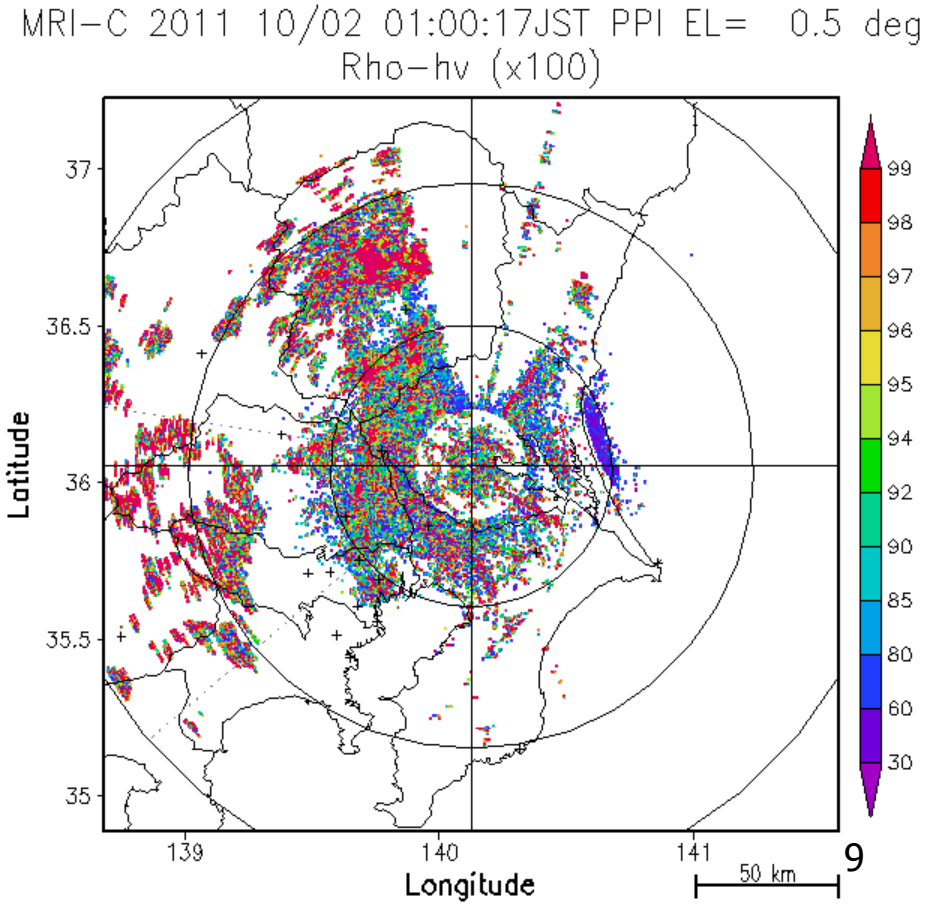




Removal of sea clutter (SC)

- SC can be efficiently identified and removed using ρ_{hv} and standard deviation of Φ_{DP}.





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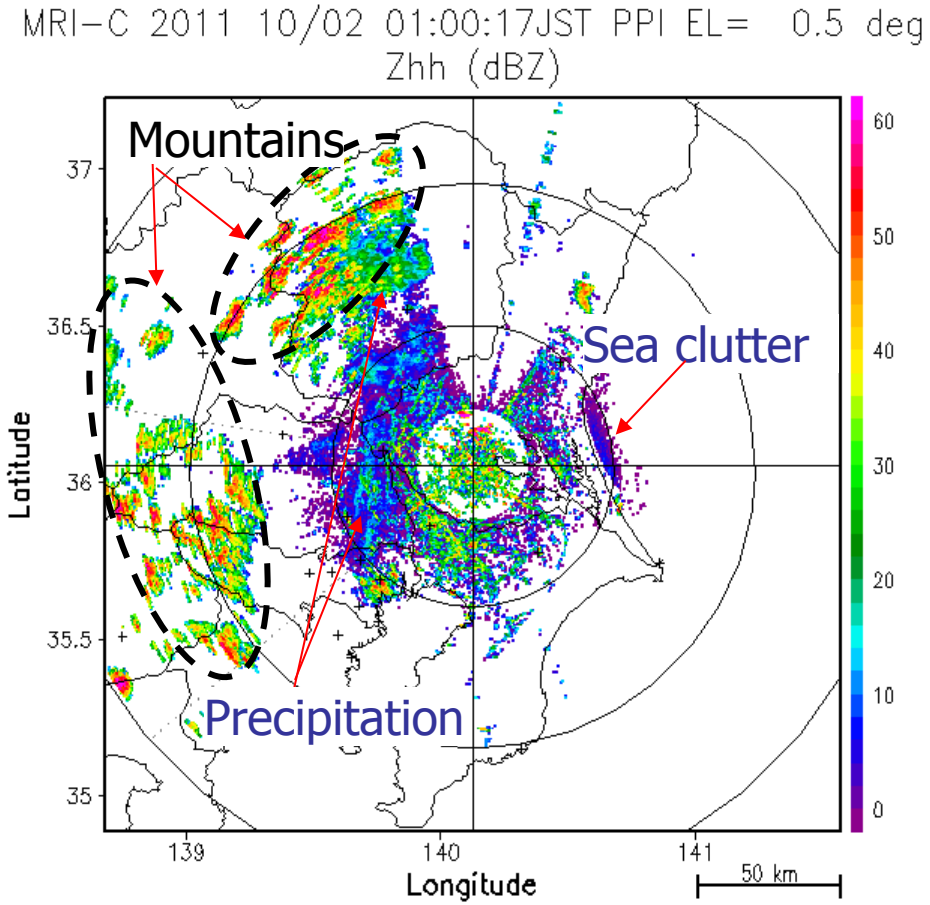

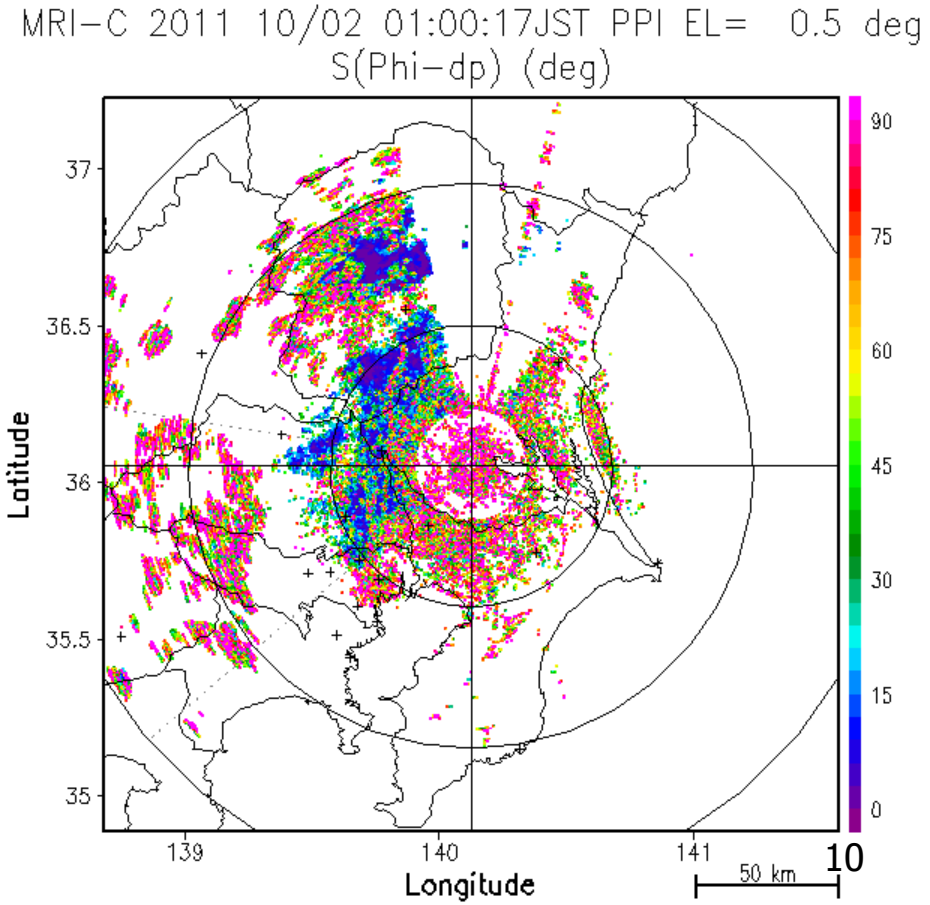

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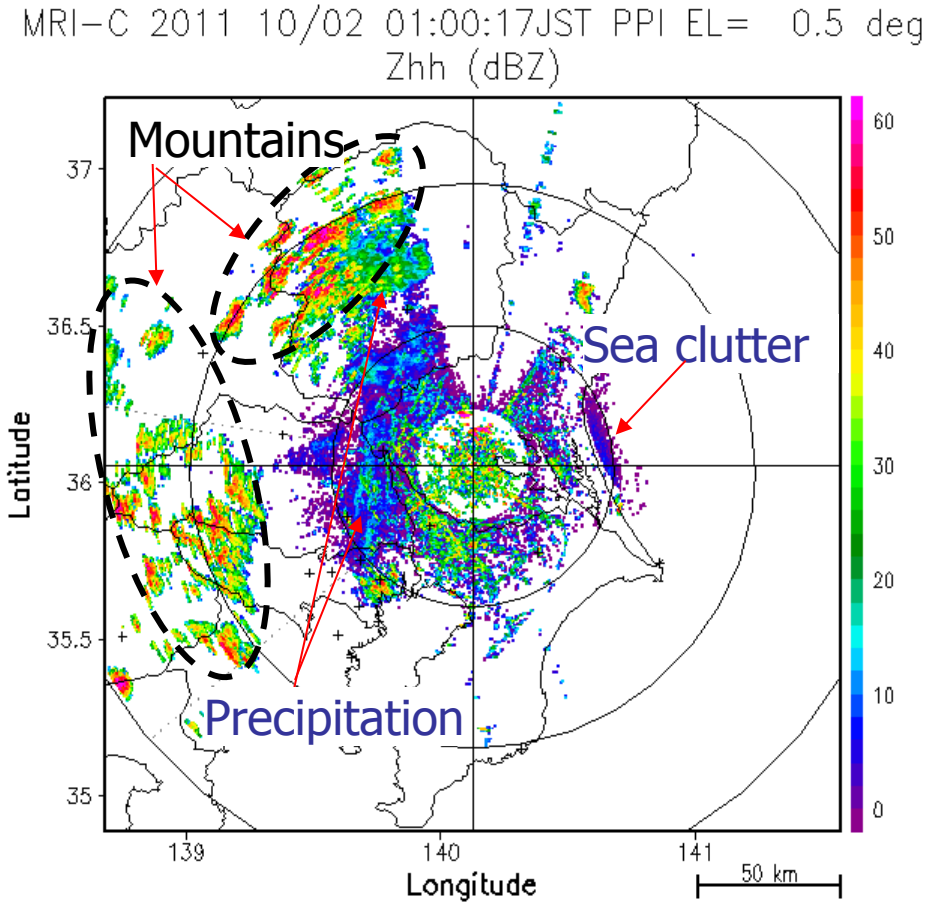

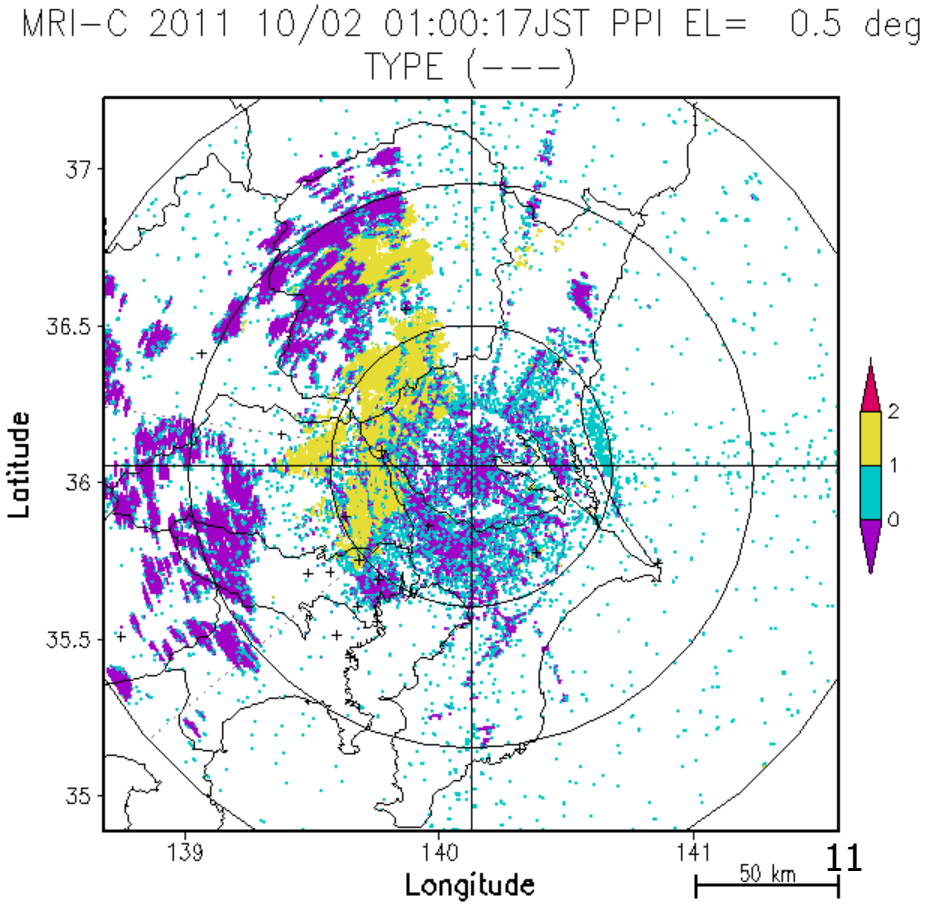

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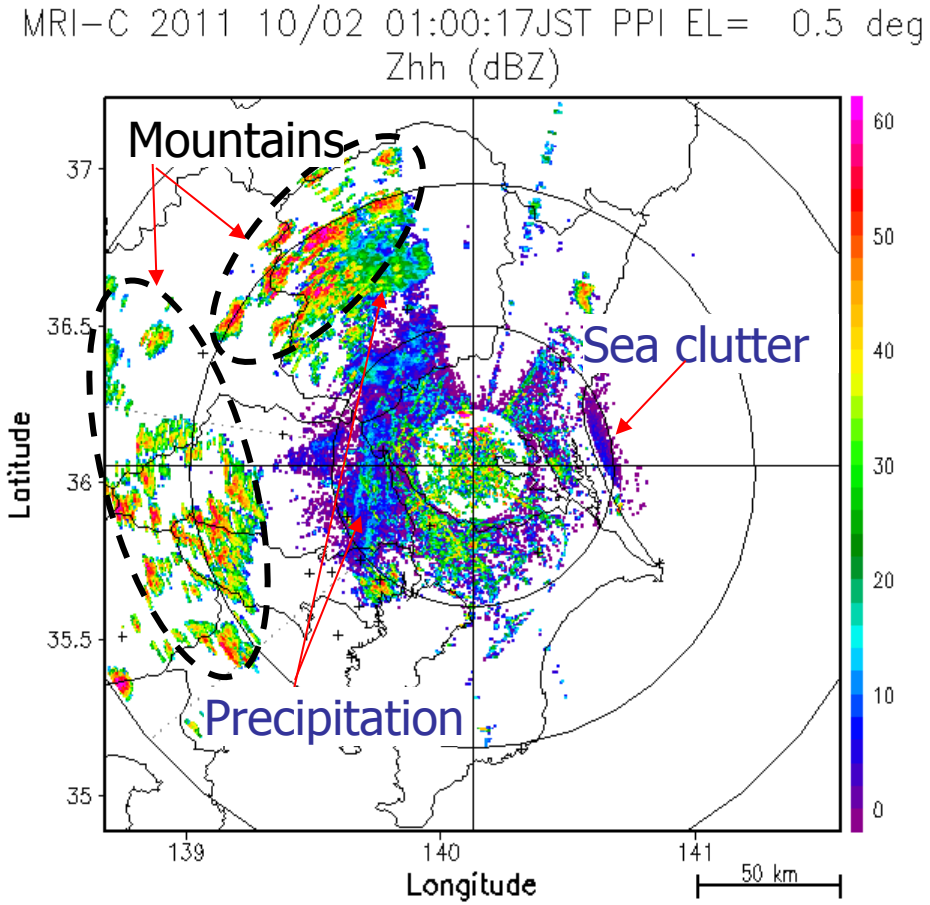
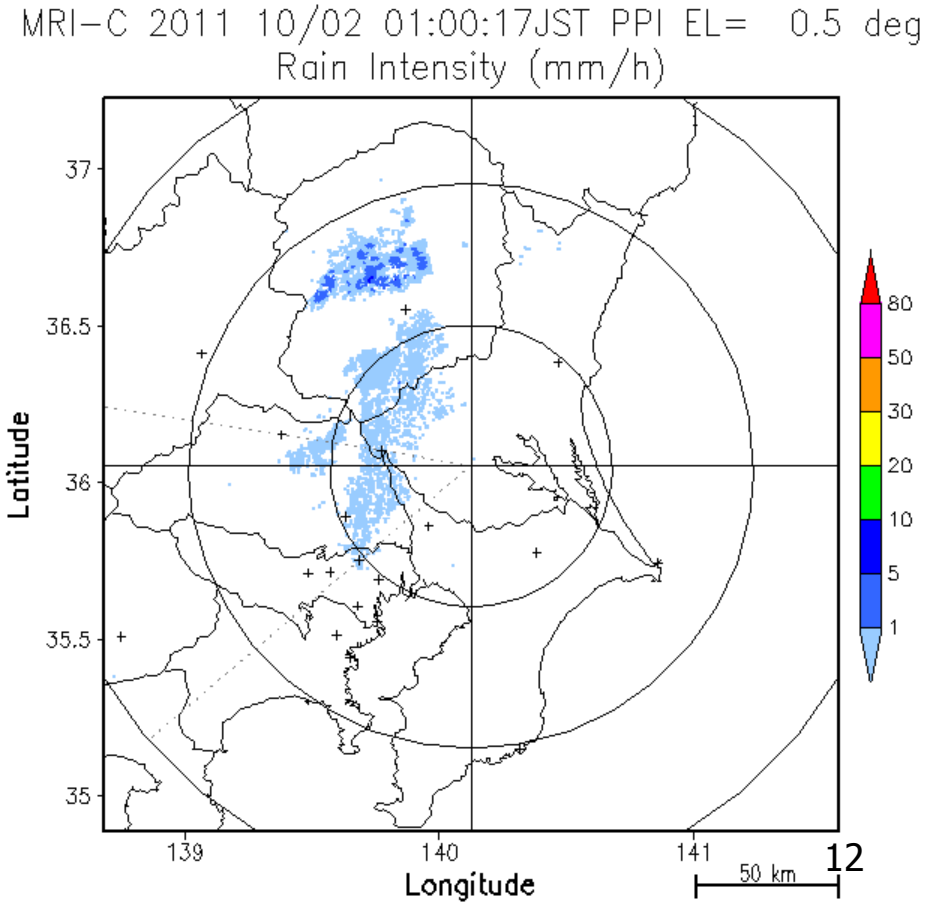
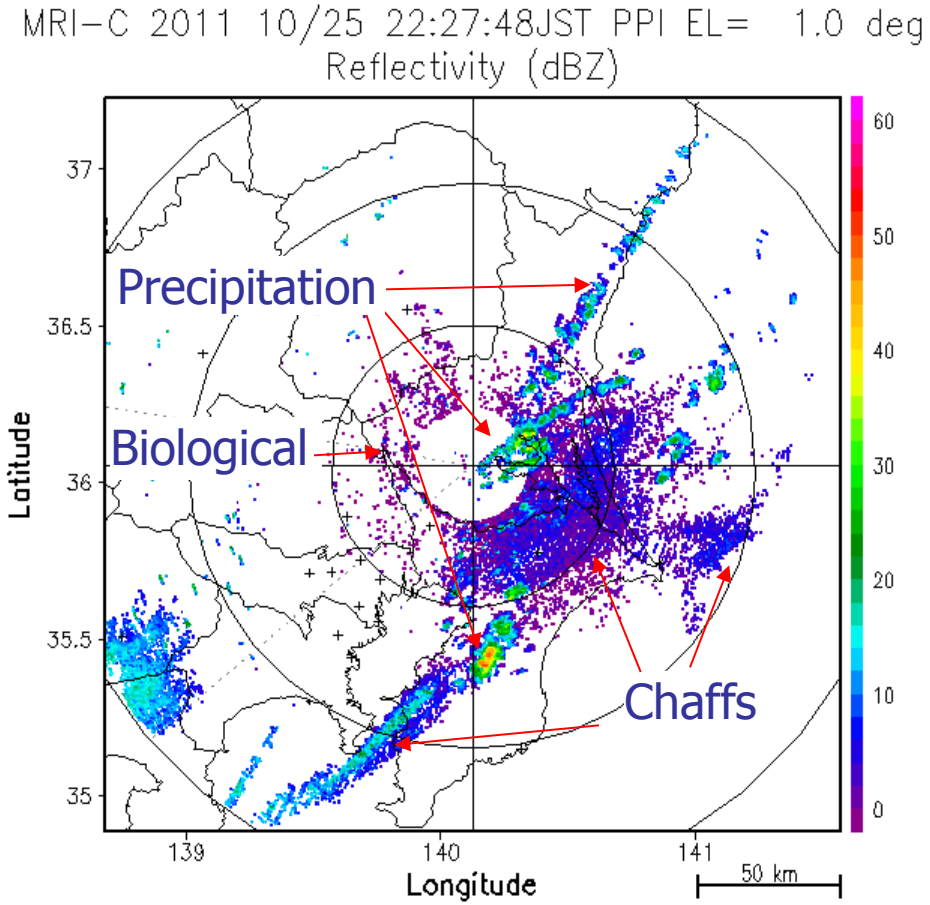
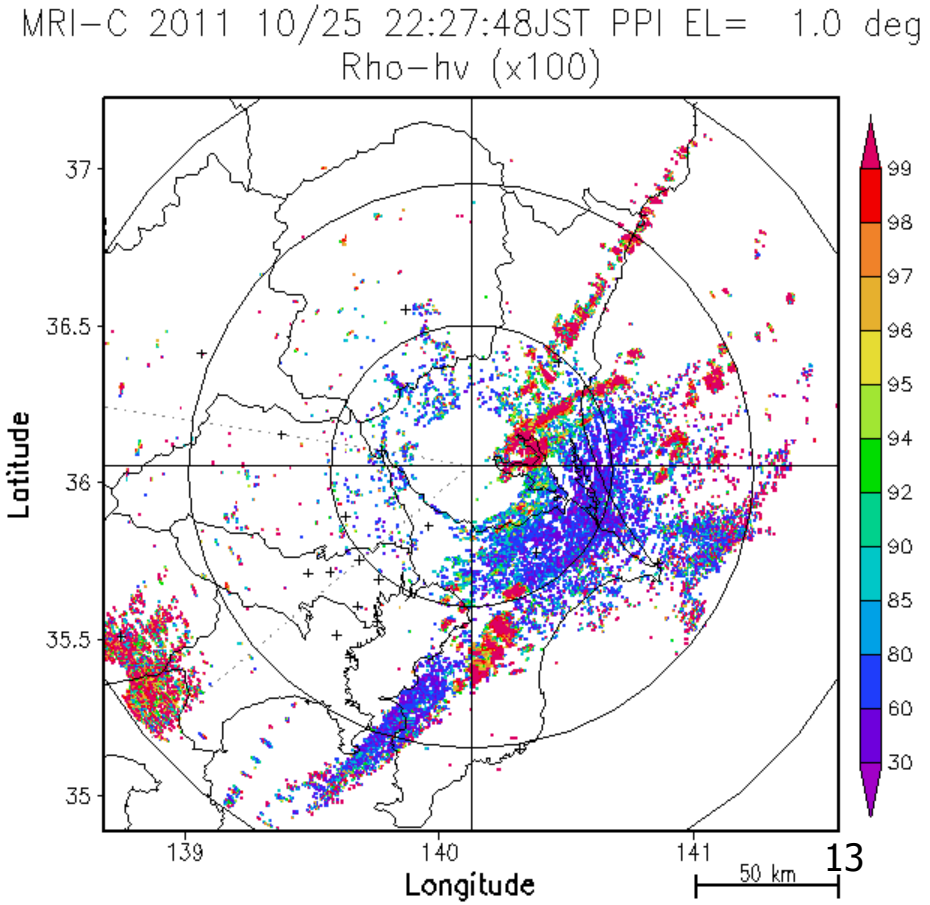




Removal of clear air echoes

- Biological echoes and chaffs are efficiently identified and removed using Zdr, ρ_{hv} and standard deviation of Φ_{DP}.





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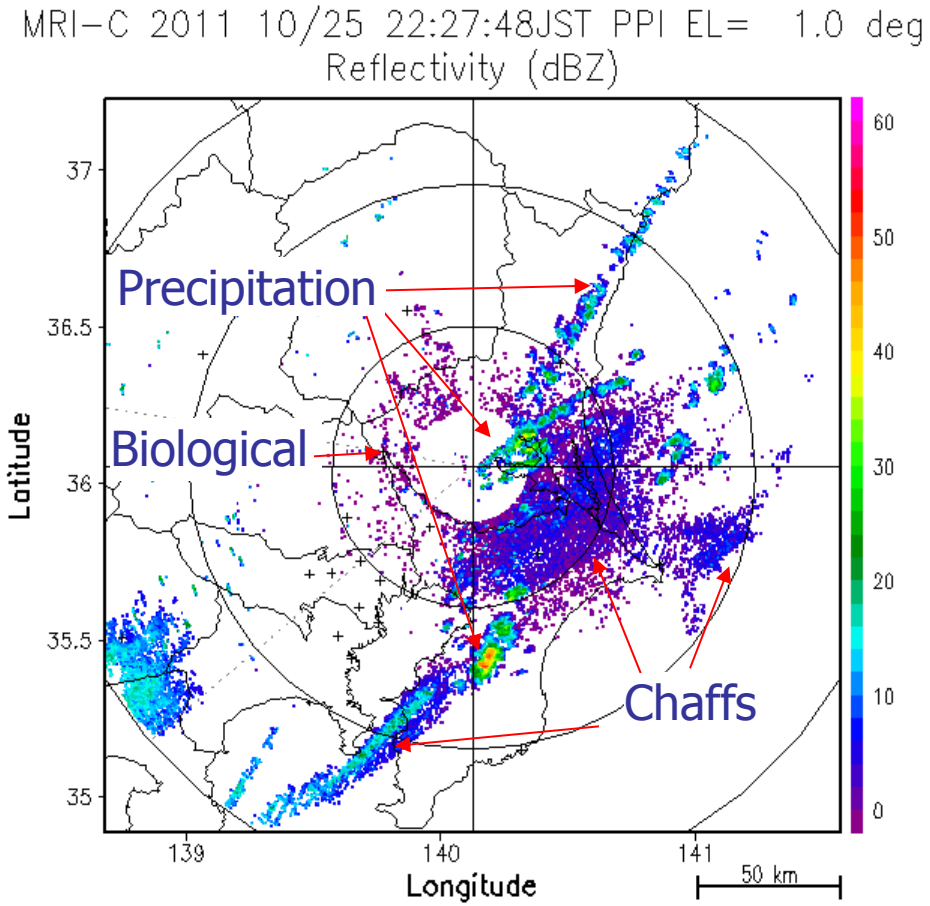

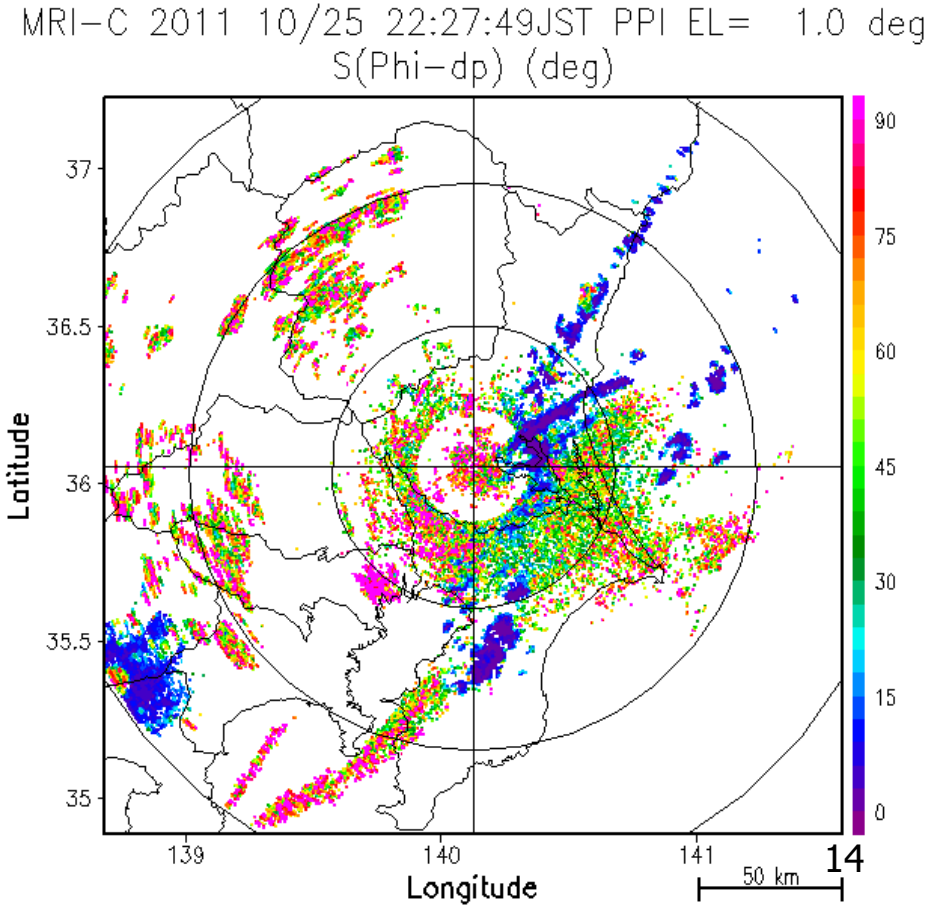

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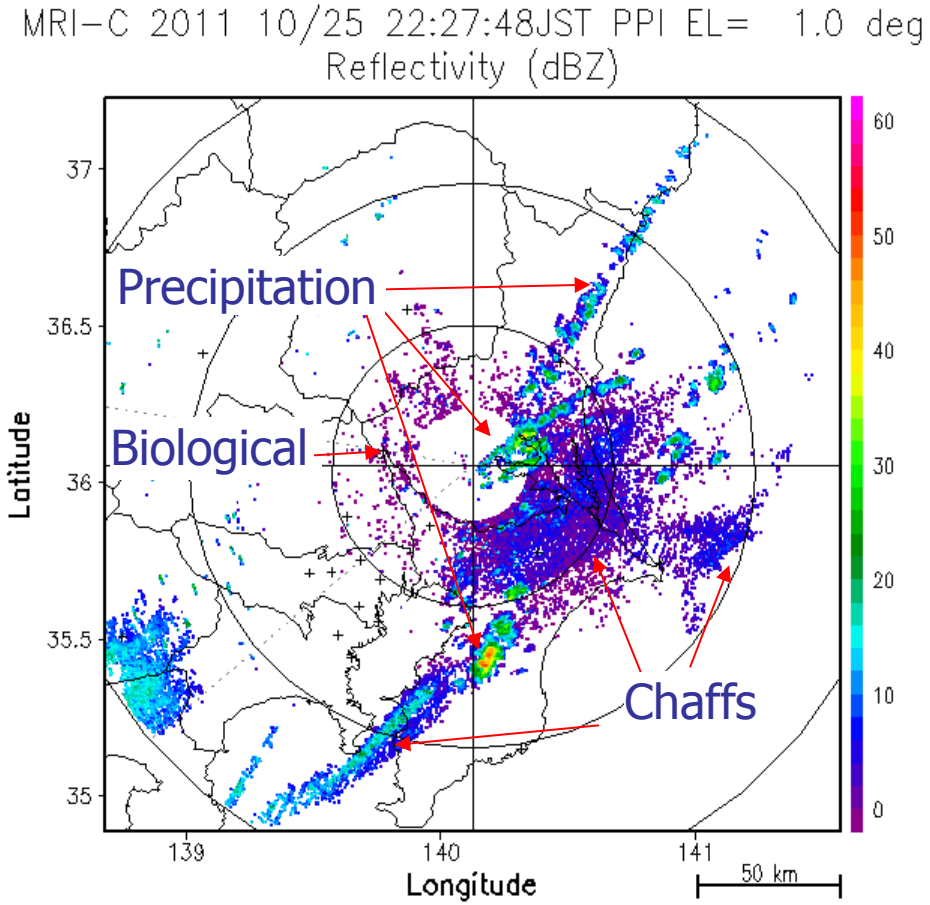
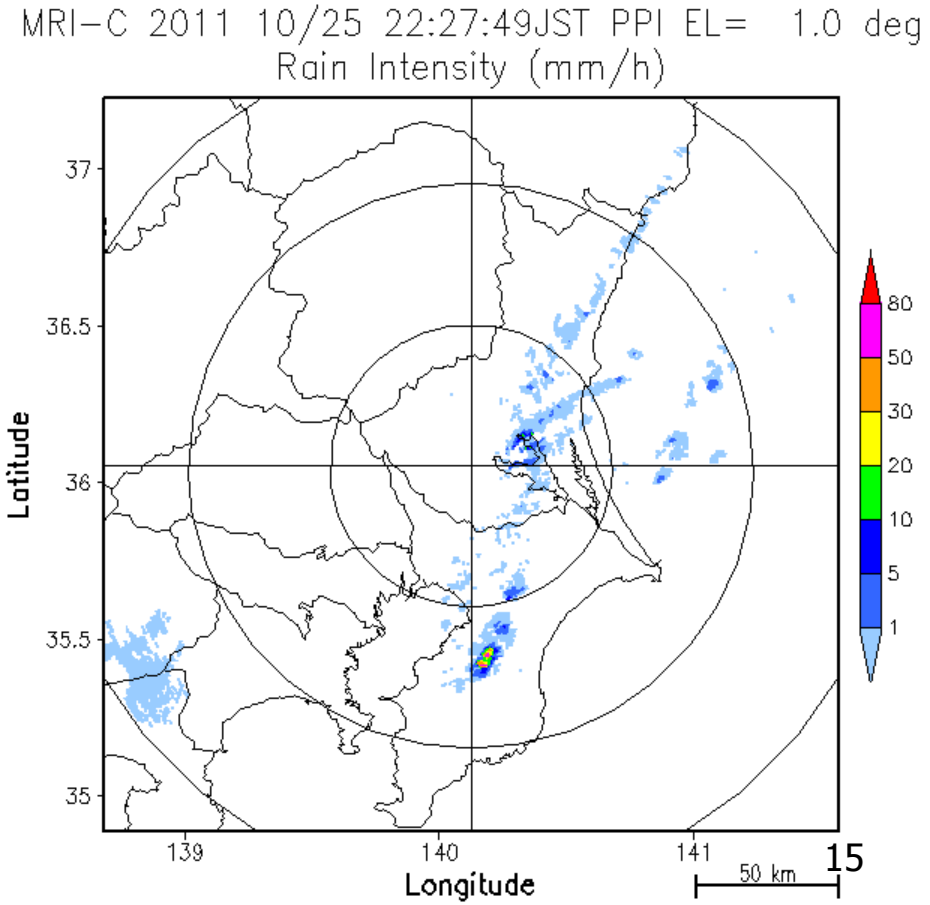


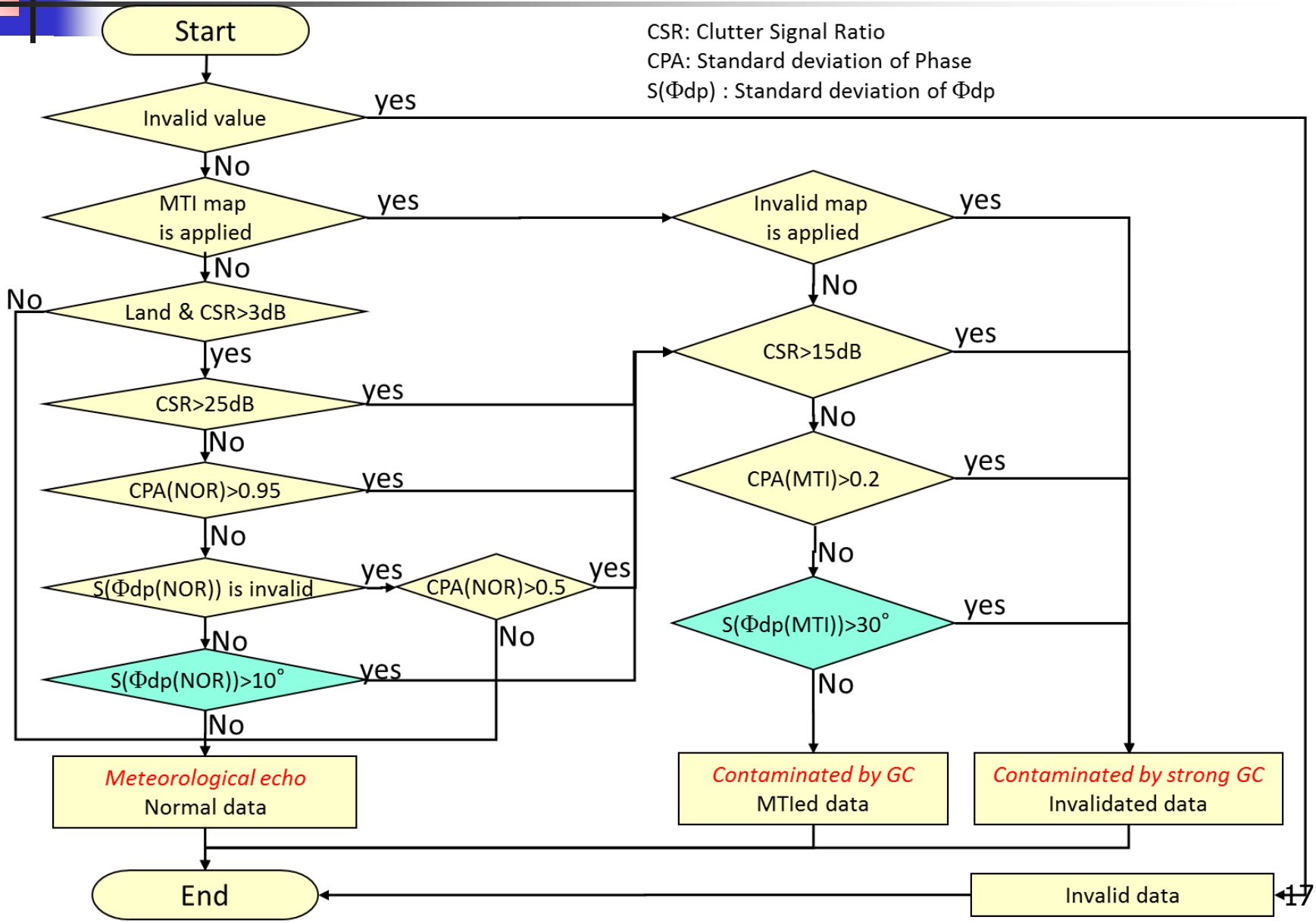


JMA's practical case for QC

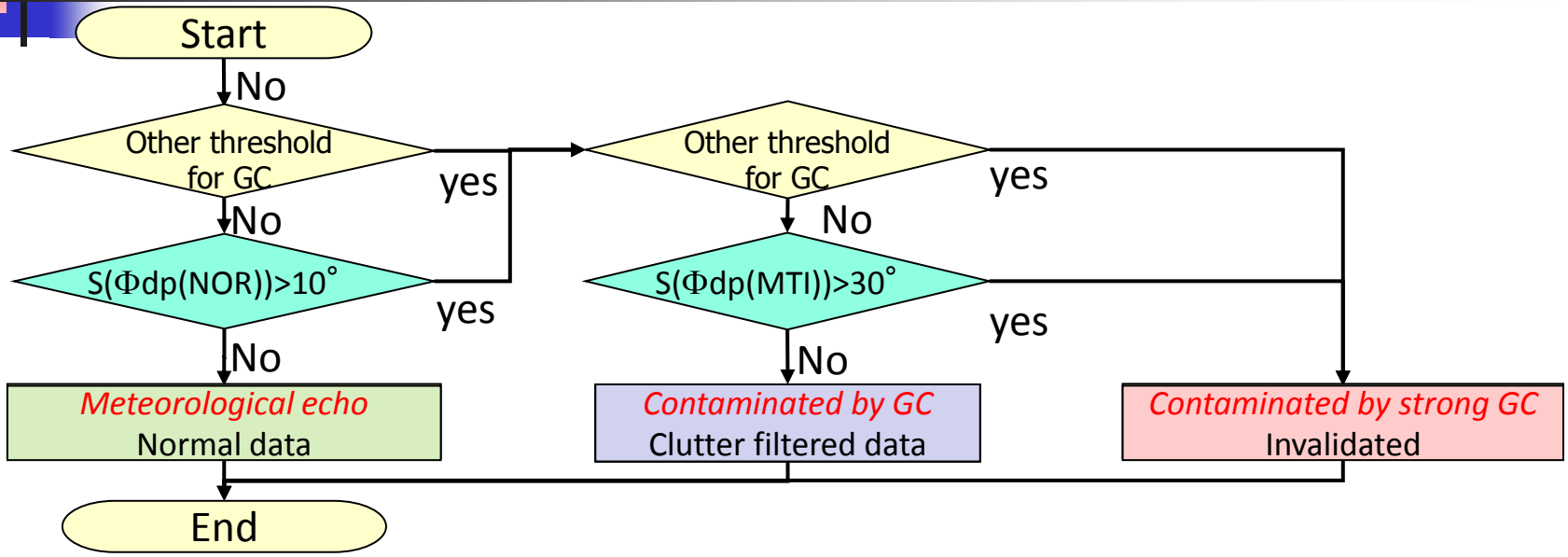
with dual-pol parameters

- Clutter removal
  - Standard deviation of Φ_{DP} ($S(\Phi_{DP})$) is used
- Clear air echo removal
  - Zdr and ρ_{hv} are used
  - Textures are not used but it seems to be useful

Clutter removal

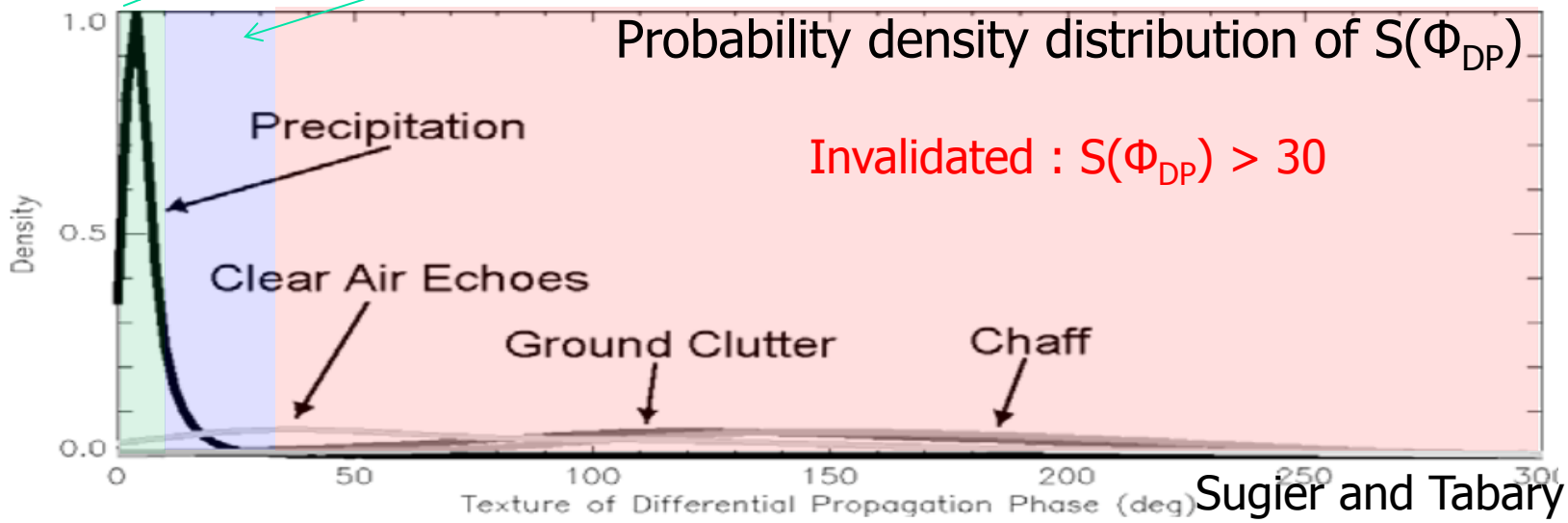


Clutter removal



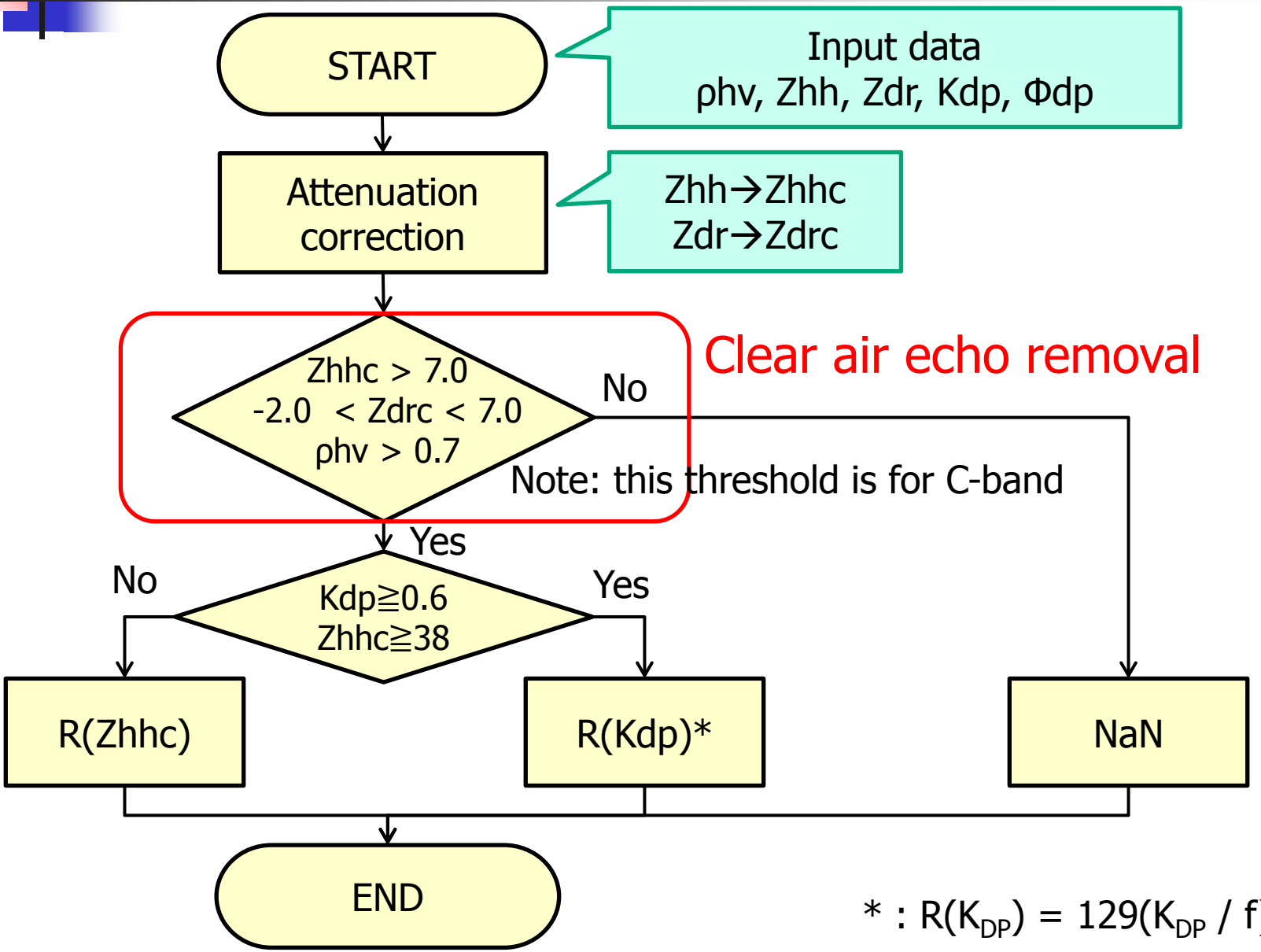
Normal :$S(\Phi_{DP})$ <10

Clutter filtered : 10< $S(\Phi_{DP})$ <30



Sugier and Tabary (2006)

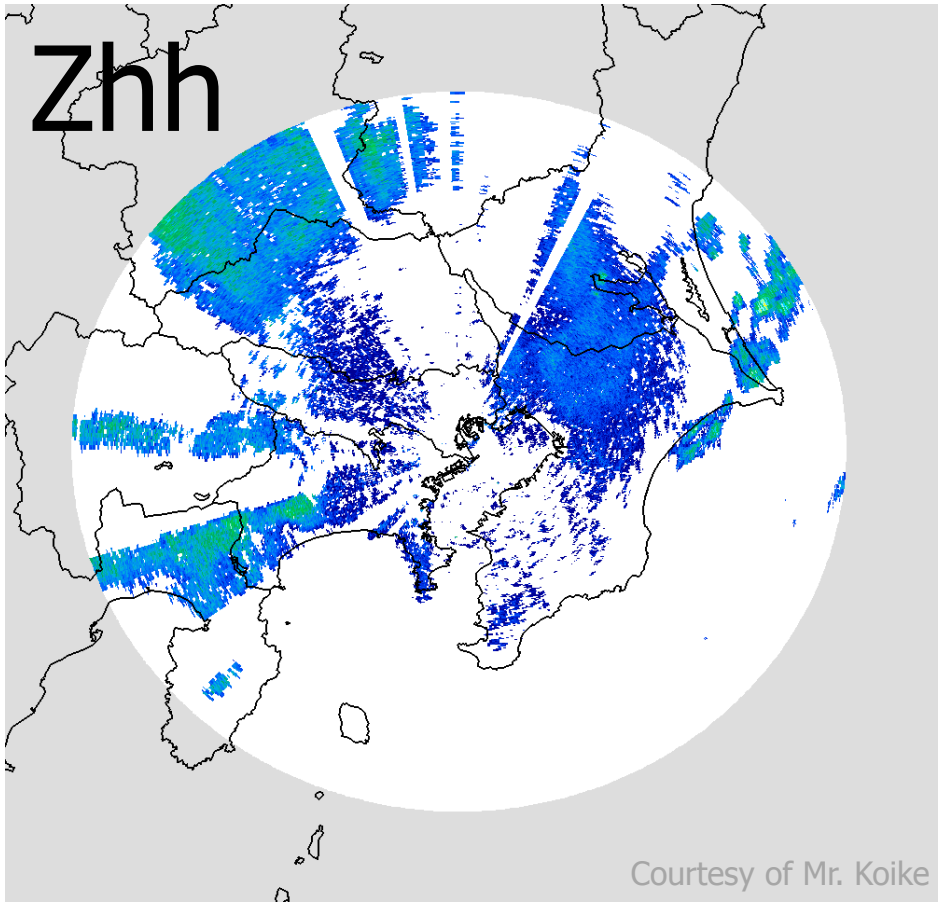
Clear air echo removal

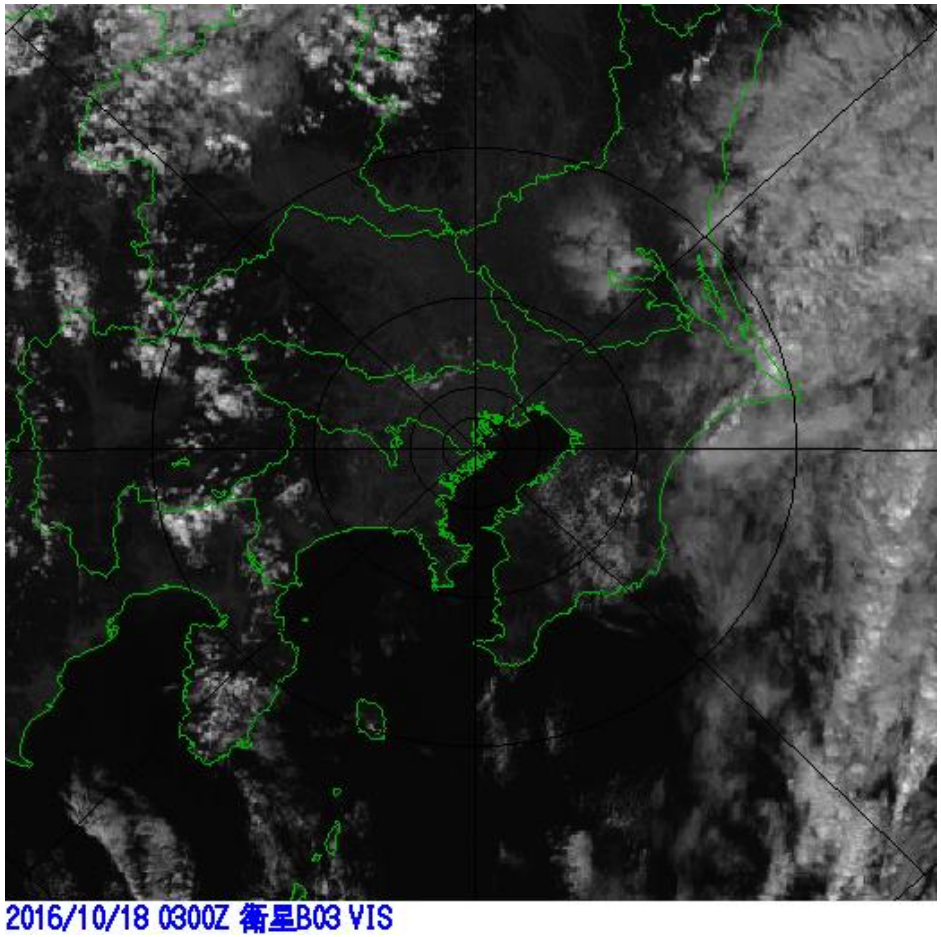


* : $R(K_{DP}) = 129(K_{DP} / f)^{0.85}$

Clear air echo removal (ex.)

Courtesy of Mr. Umehara

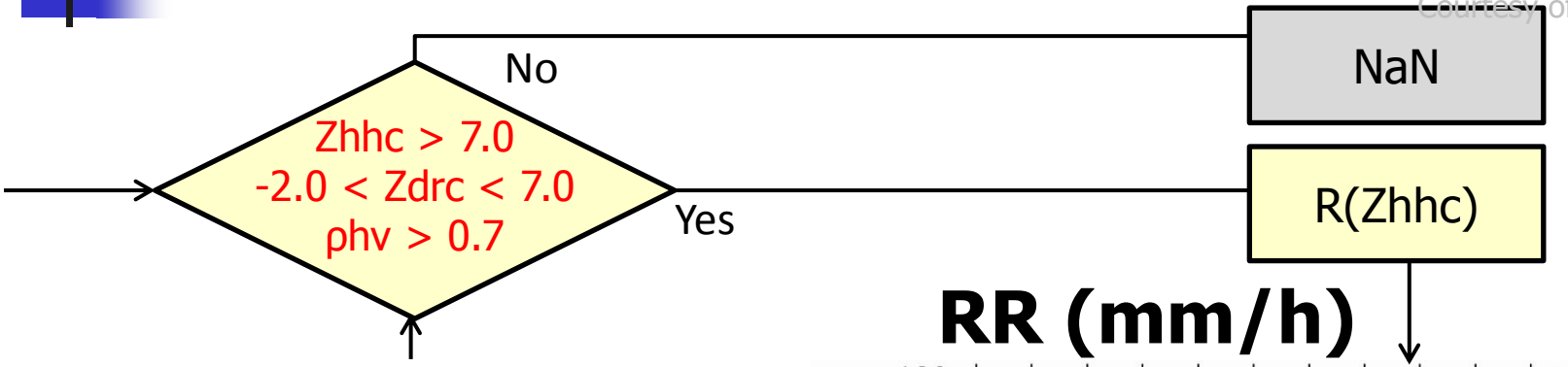


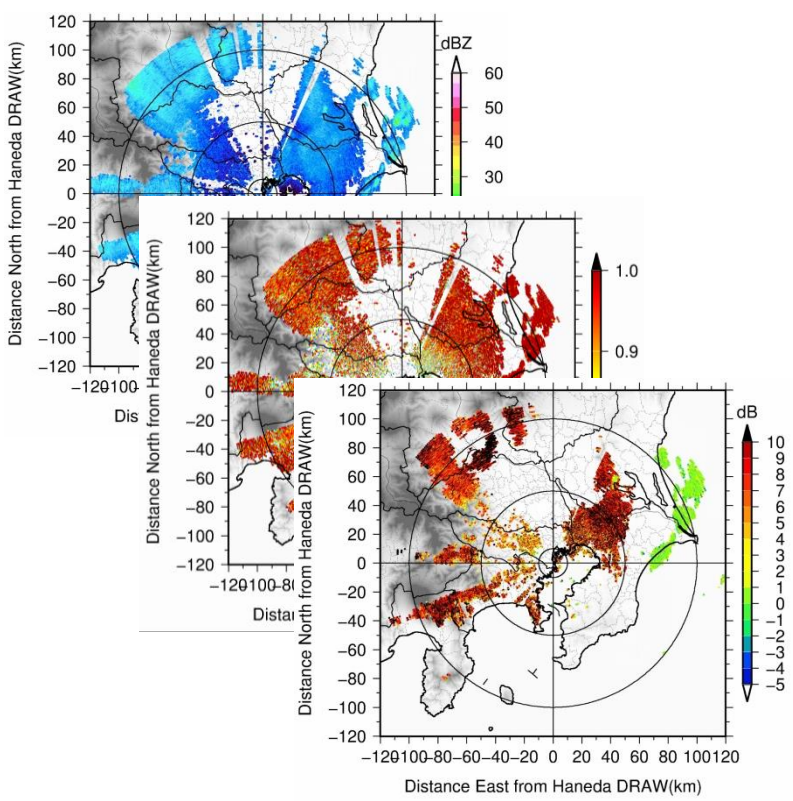


It seems all parts of this echo are meteorological echo but…

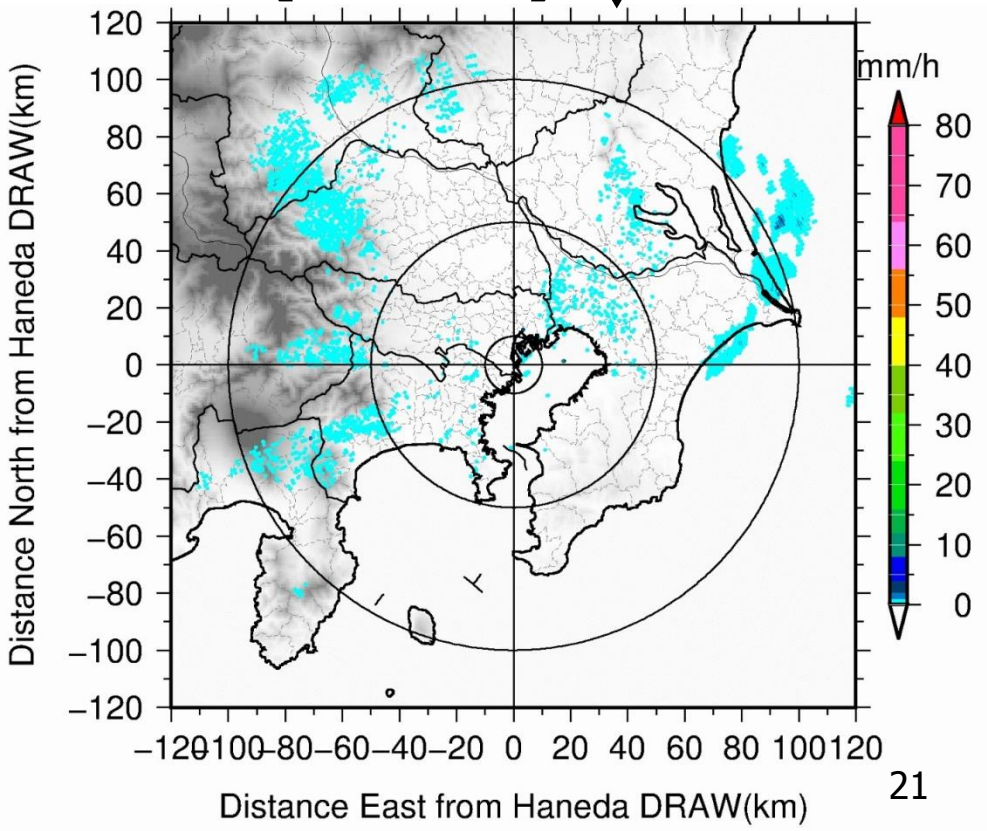
Clear air echo removal (ex.)

Courtesy of Mr. Umehara





RR (mm/h)



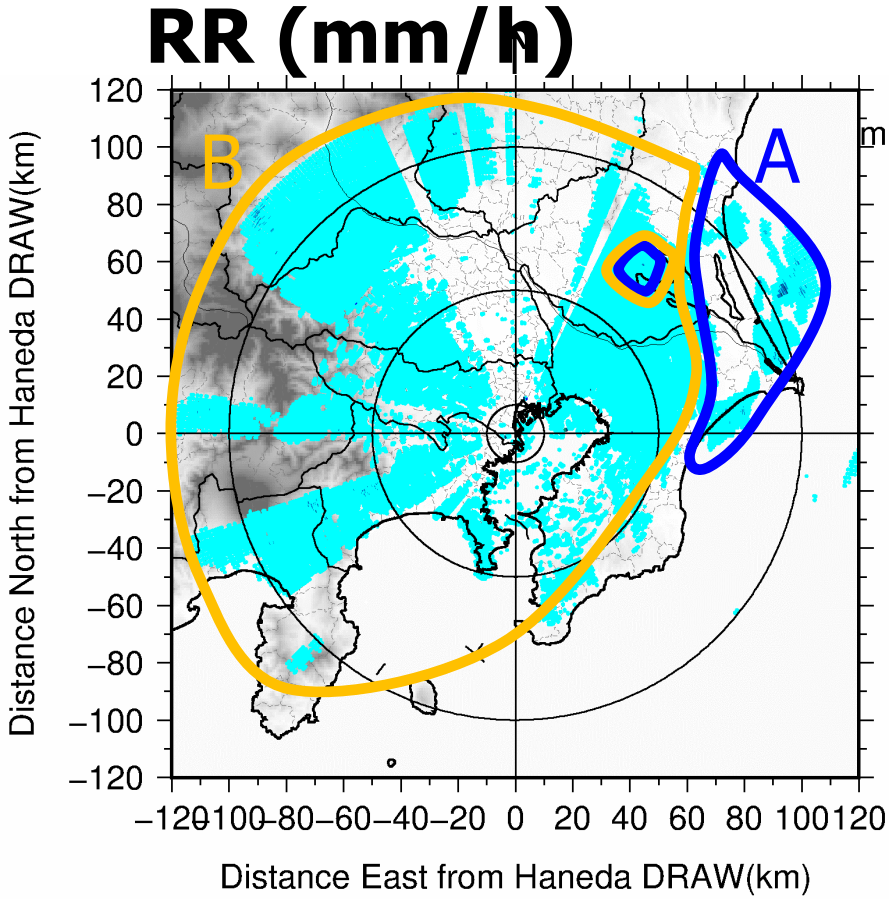
Clear air echo removal (ex.)

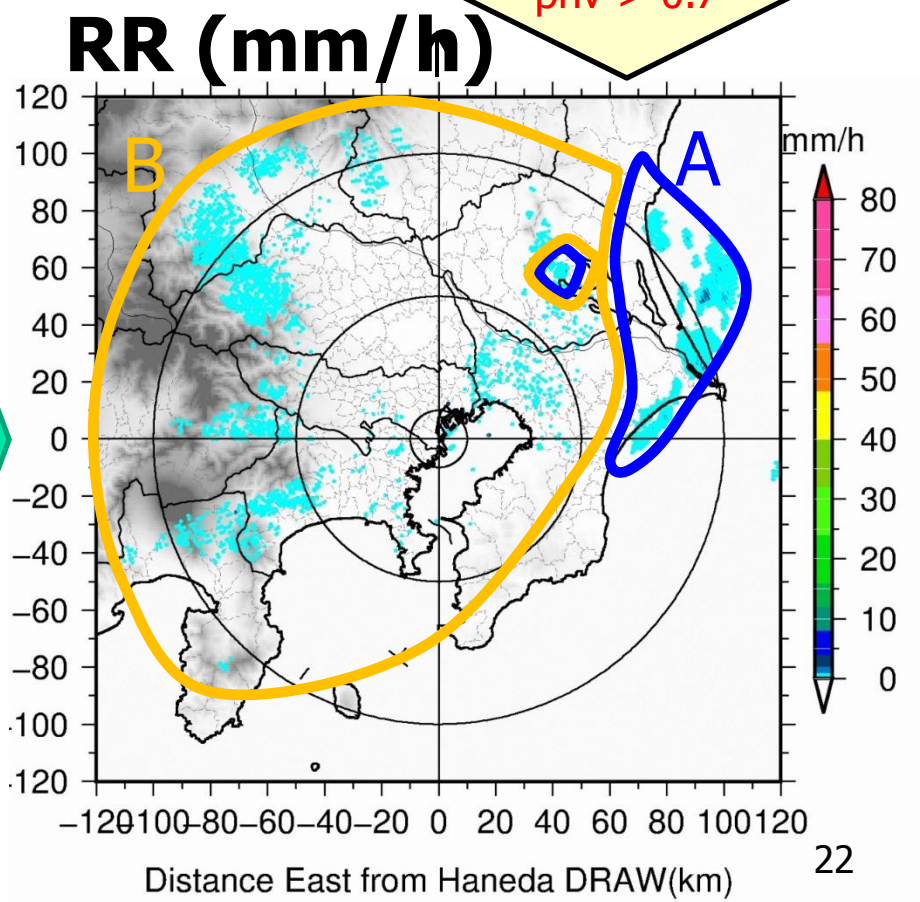
Courtesy of Mr. Umehara

- Most of clear air echo can be removed
- Clear air echo might be still remained

Zhhc > 7.0
-2.0 < Zdrc < 7.0
ρhv > 0.7

No threshold





Summary

- Ground clutter removal
  - S(Φdp) is useful
- Sea clutter removal
  - S(Φdp) and ρhv are useful
- Clear air echo removal
  - S(Φdp), ρhv, Zdr and S(Zdr) are useful
- JMA's practical case