Space-time extrapolation of precipitation with data assimilation

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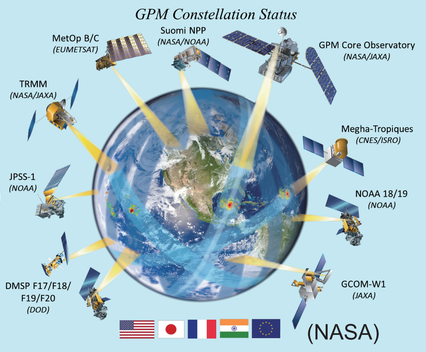
1. Precipitation observations

- Global Satellite Mapping of Precipitation (GSMaP, Kubota et al. 2007)
  - Hourly-updated precipitation map at 0.1°×0.1° resolution (60°S-60°N)
- Phased-Array Weather Radar (PAWR, Ushio et al. 2015)
  - 100-m resolution 3D volume scans every 30 seconds within 60 km

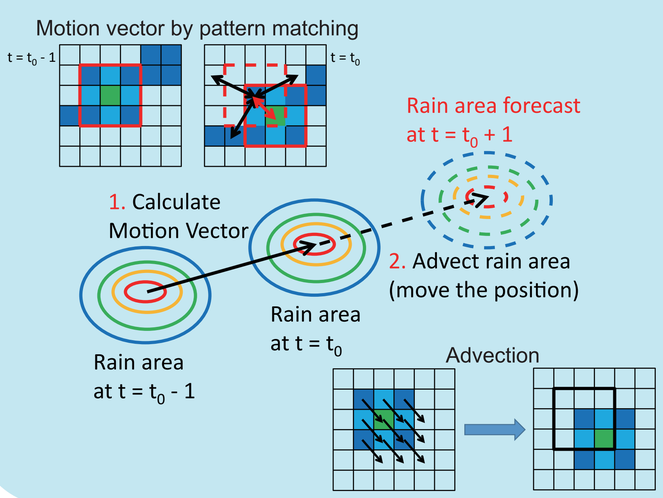


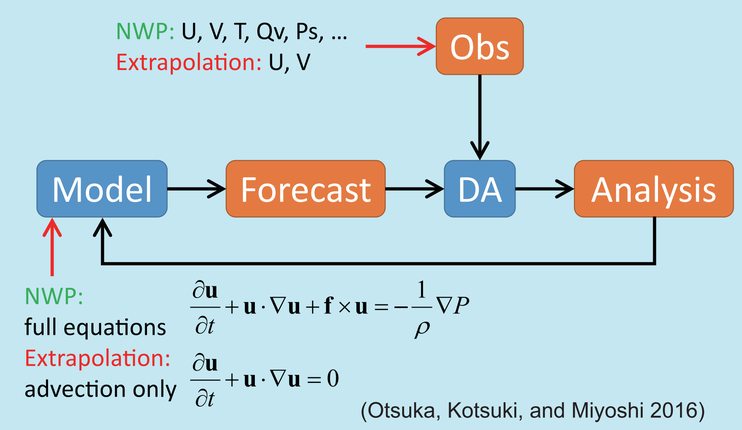
(NASA)

(JAXA)

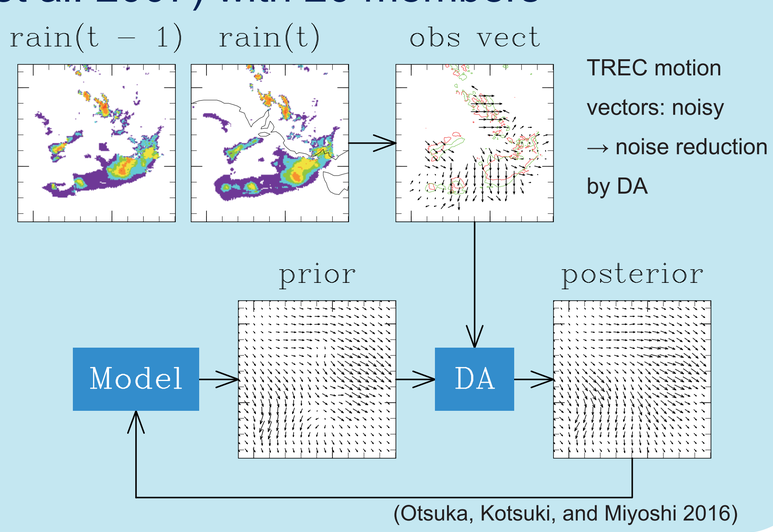
2. Method

- Data assimilation is applied to improve noisy motion vectors in space-time extrapolation.
- Motion vector: Tracking Radar Echoes by Correlation (TREC, Rinehart and Garvey 1978)
- Data assimilation: Local Ensemble Transform Kalman Filter (LETKF, Hunt et al. 2007) with 20 members





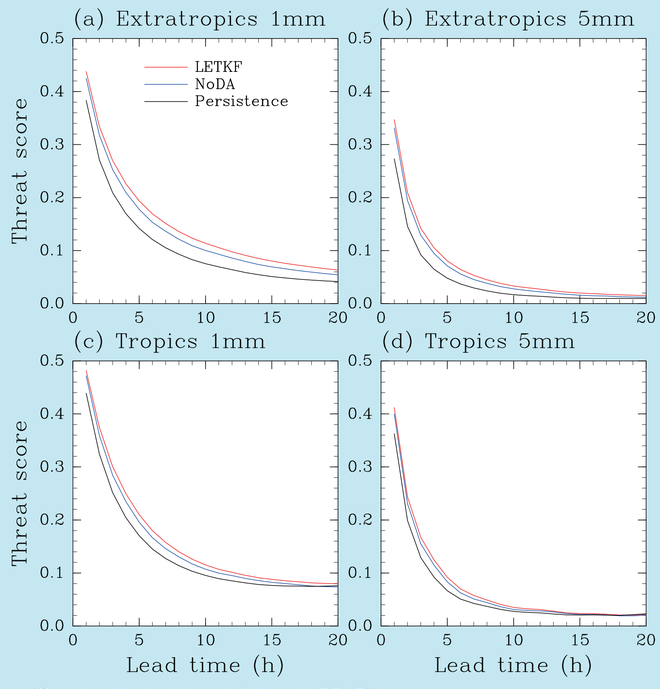
(Otsuka, Kotsuki, and Miyoshi 2016)



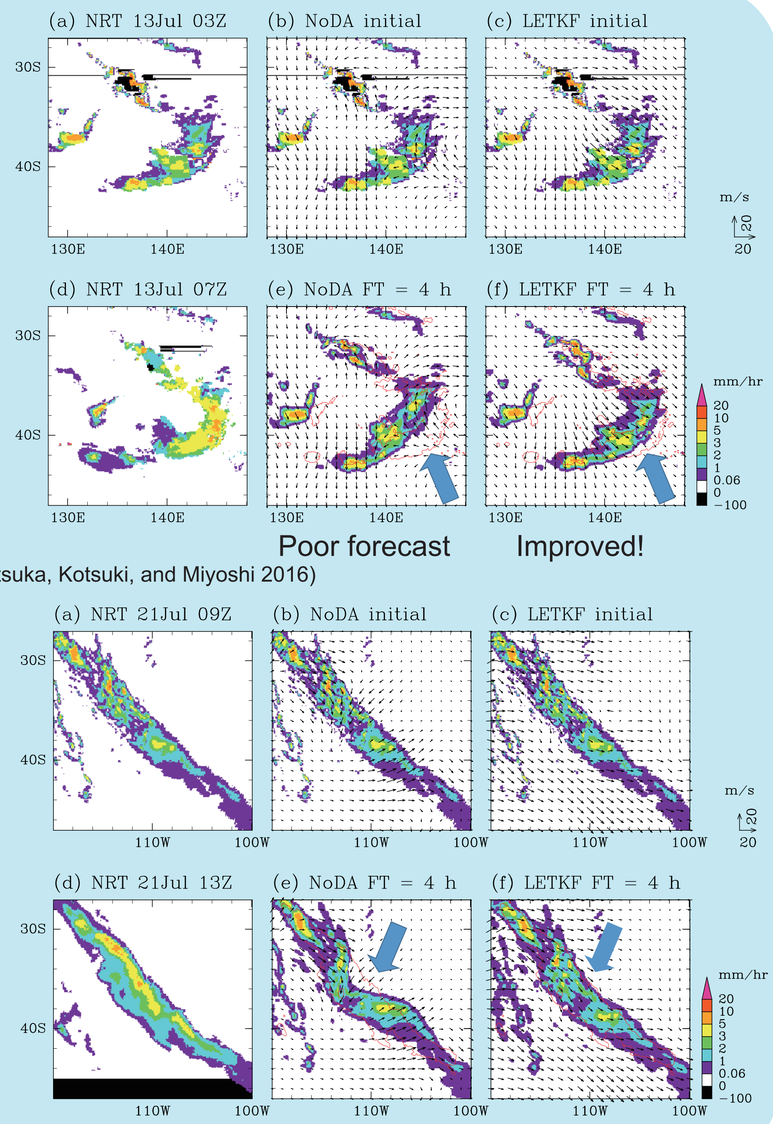
(Otsuka, Kotsuki, and Miyoshi 2016)

3. Nowcasting with GSMaP

- LETKF: motions of precipitation areas are well reproduced.
- NoDA: Erroneous motion vectors distort precipitation patterns.
- LETKF > NoDA in the extratropics

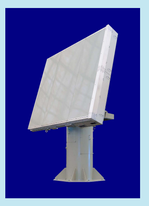


(Otsuka, Kotsuki, and Miyoshi 2016)



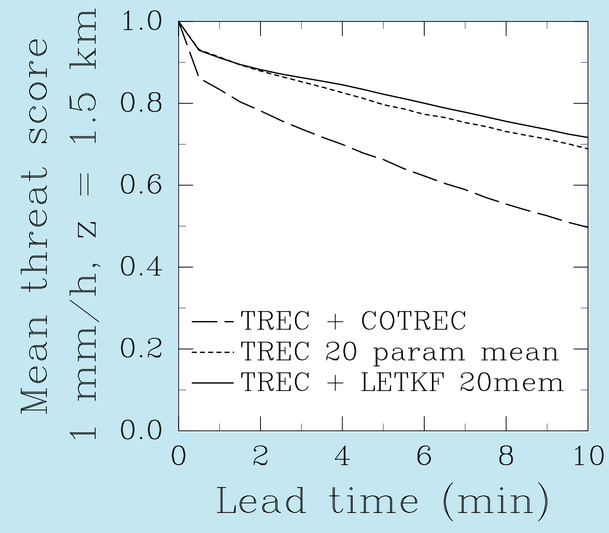
(Otsuka, Kotsuki, and Miyoshi 2016)

4. Nowcasting with PAWR



(NICT)

- 3D space-time extrapolation experiments are performed.
- Preliminary tests with LETKF show improvements against NoDA.



5. Conclusion

- LETKF was implemented for space-time extrapolation. TREC-derived motion vectors were updated.
- The system was tested with GSMaP NRT to perform global precipitation nowcasting. DA improved the accuracy.
- The system is extended to 3D and applied to phased array weather radar data. The results are promising.
- Otsuka, Kotsuki, and Miyoshi, 2016: *Wea. Forecasting*, in print, doi:10.1175/WAF-D-16-0039.1
- Otsuka et al., 2016: *Wea. Forecasting*, **31**, 329-340, doi:10.1175/WAF-D-15-0063.1