

Kashima Ray-Tracing Tools

波線追跡ツールKARATによる 精密大気遅延推定の補正効果

情報通信研究機構

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内容

目的：KARATによる伝搬遅延量補正効果を
1年分のGEONETデータ解析で評価

- KARATの機能毎に性能評価

- Piece-wise linear model

- Thayer model

- Eikonal equation

- PPP計算結果で比較

- まとめ

KARAT calculation schemes

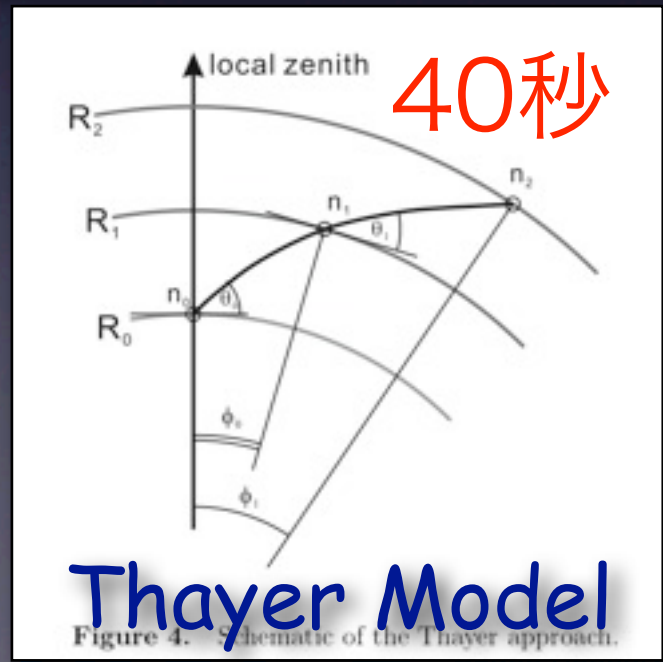
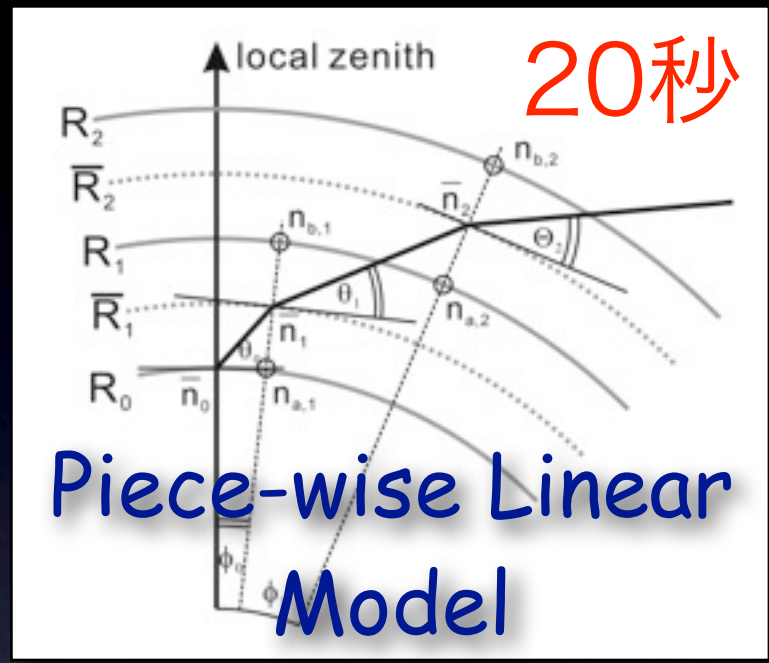
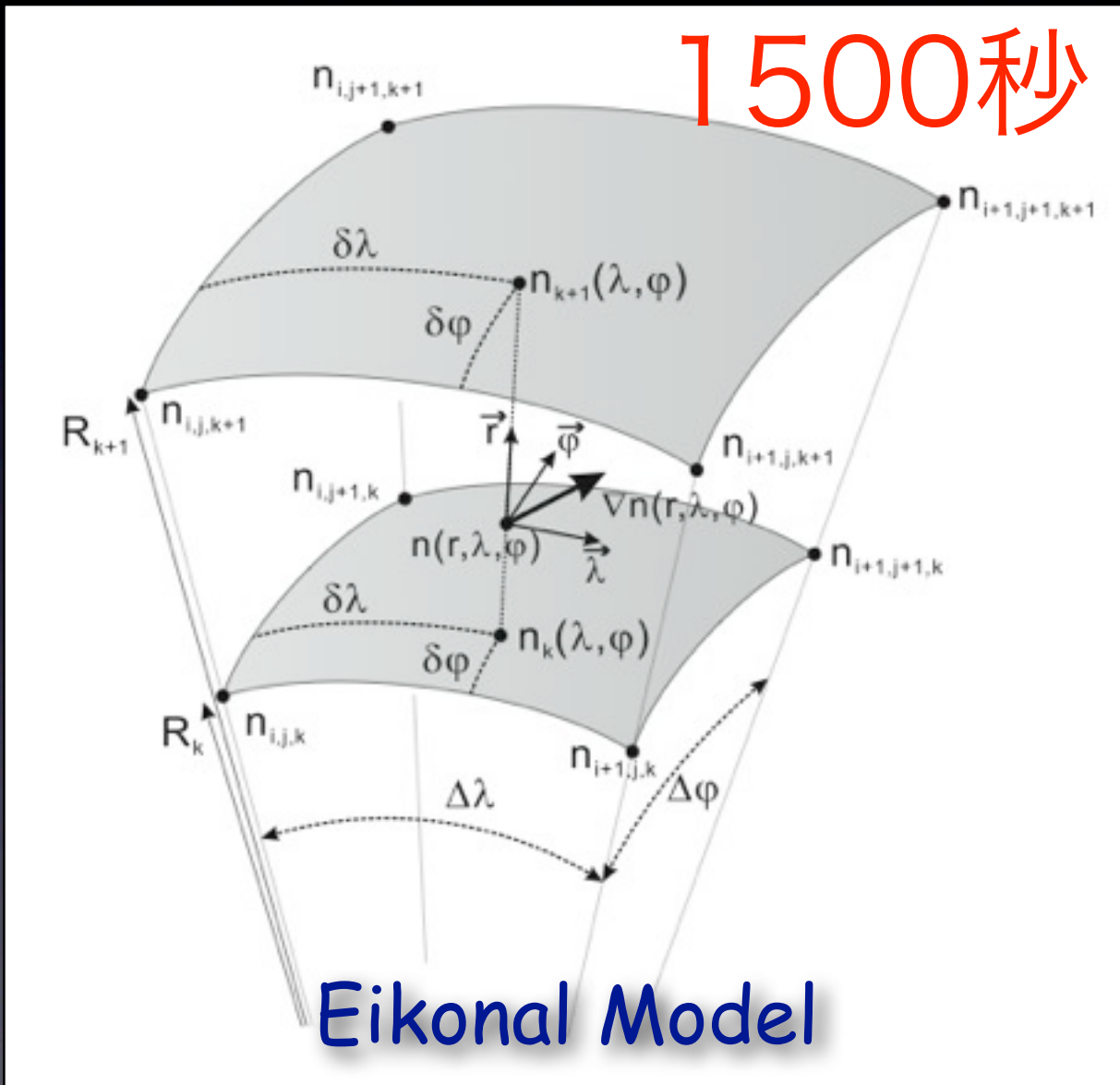
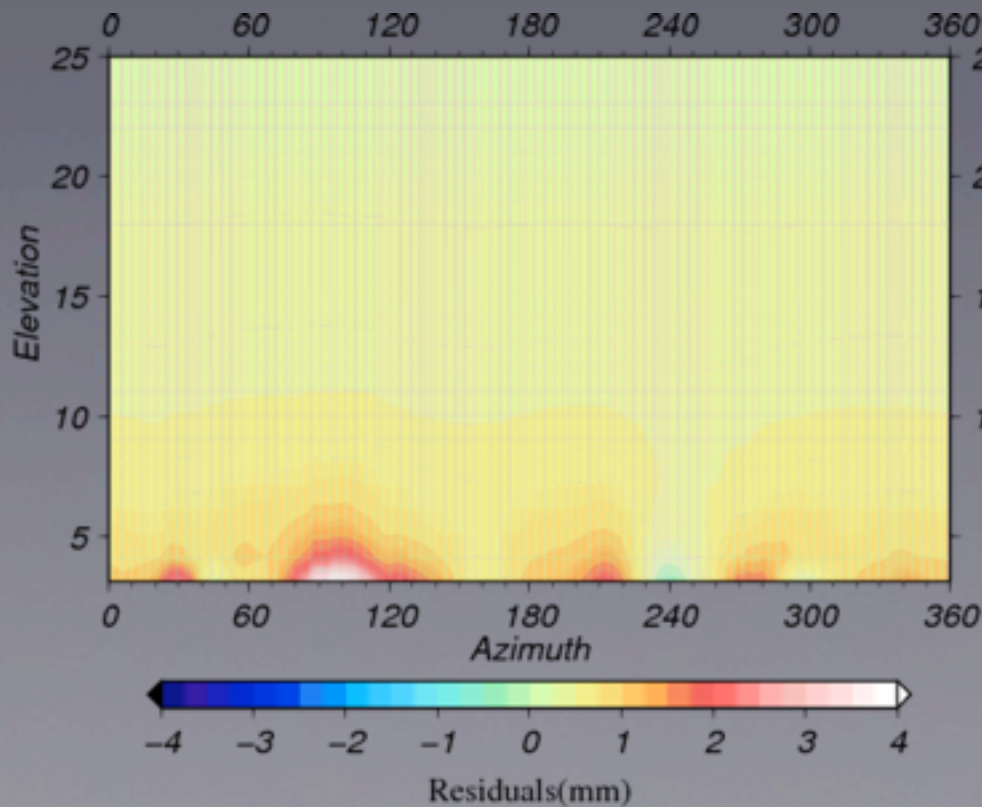


Figure 4. Schematic of the Thayer approach.

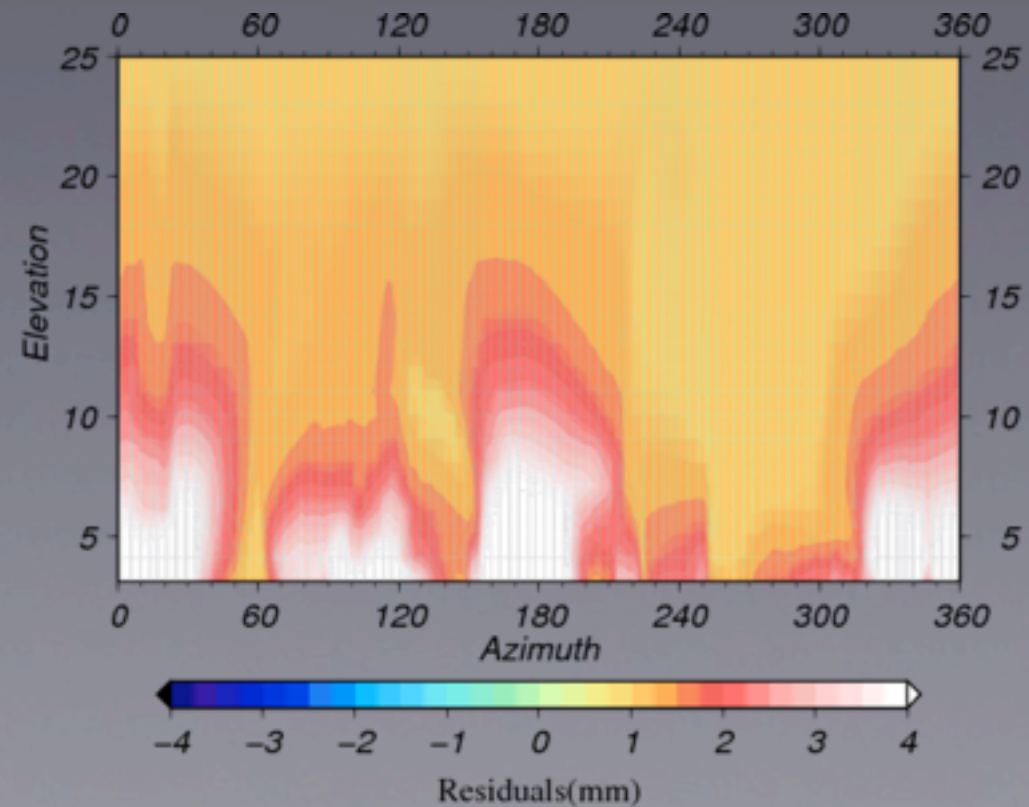
Azimuthal Residuals

Thayer - Symmetry



GM 2009 May 21 03:52:44 Thayer - Symmetry

Eikonal - Symmetry

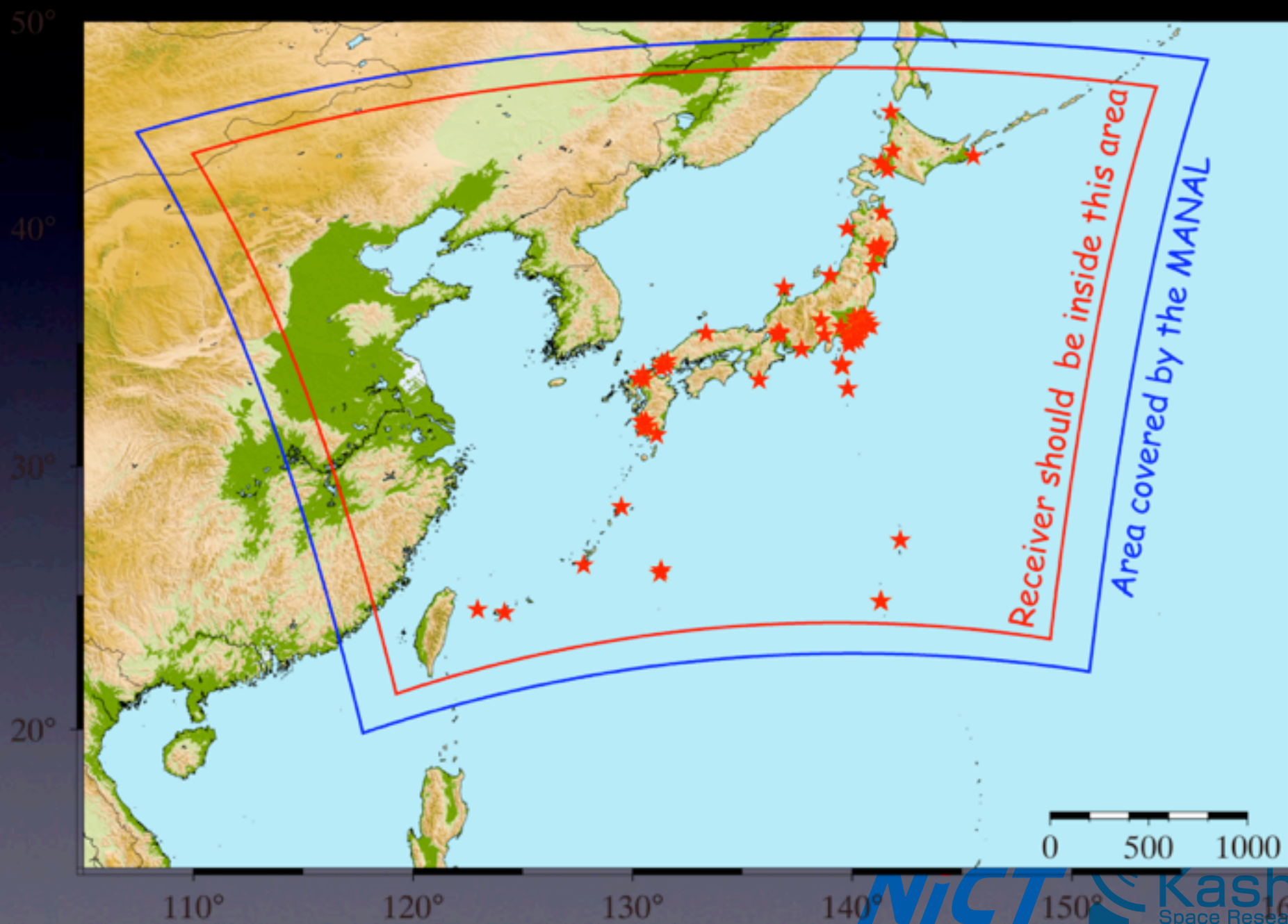


GM 2009 May 21 03:52:47 Eikonal - Symmetry

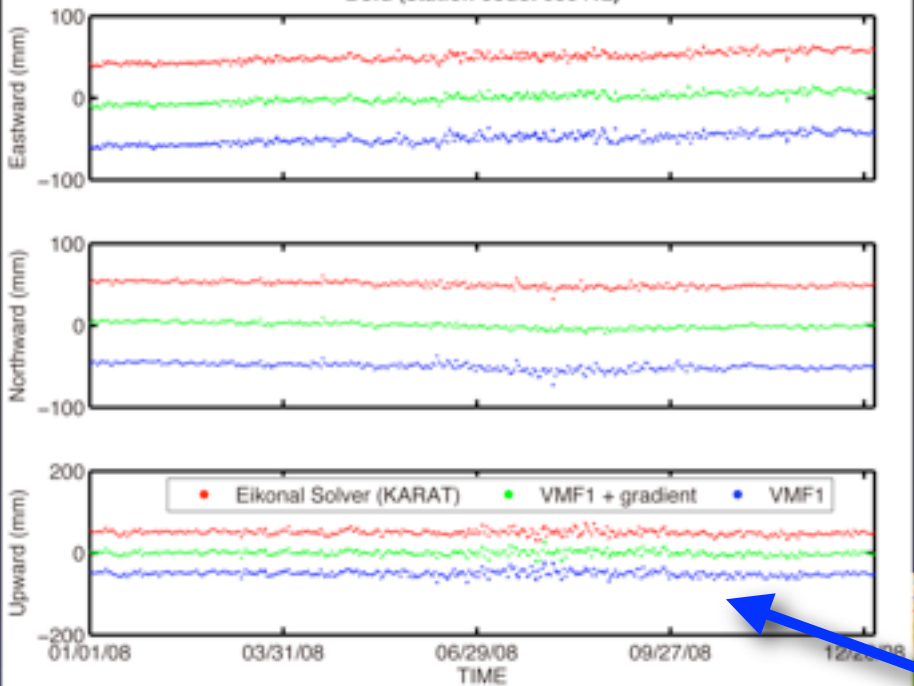
GPS/PPP Analysis

- DATA: GEONET/RINEX
 - KARAT reduced and Original
- period: 2008.1.1-12.31 (interval: 300sec.)
- Stations: 68 GEONET Stations
- mapping functions: VMF1, GMF
 - with gradient & w/o gradient
- Elevation cut off: 10°
- processing: GPStools Ver. 0.64 (Takasu and Kasai [2003])

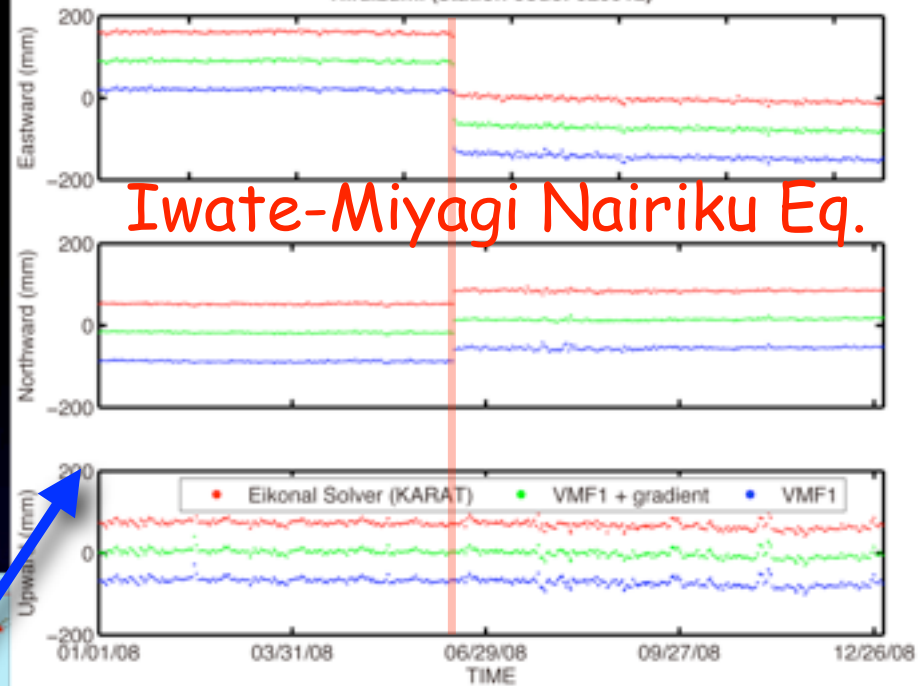
MANAL(メソスケール客観解析)データ



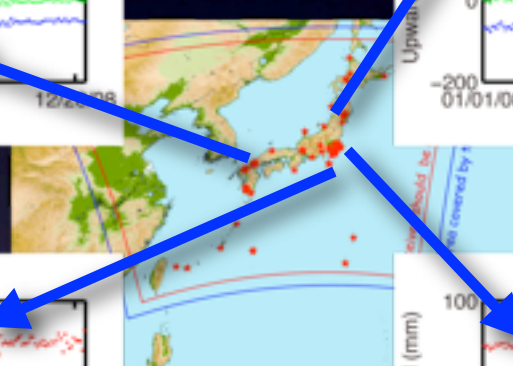
Bofu (station code: 950412)



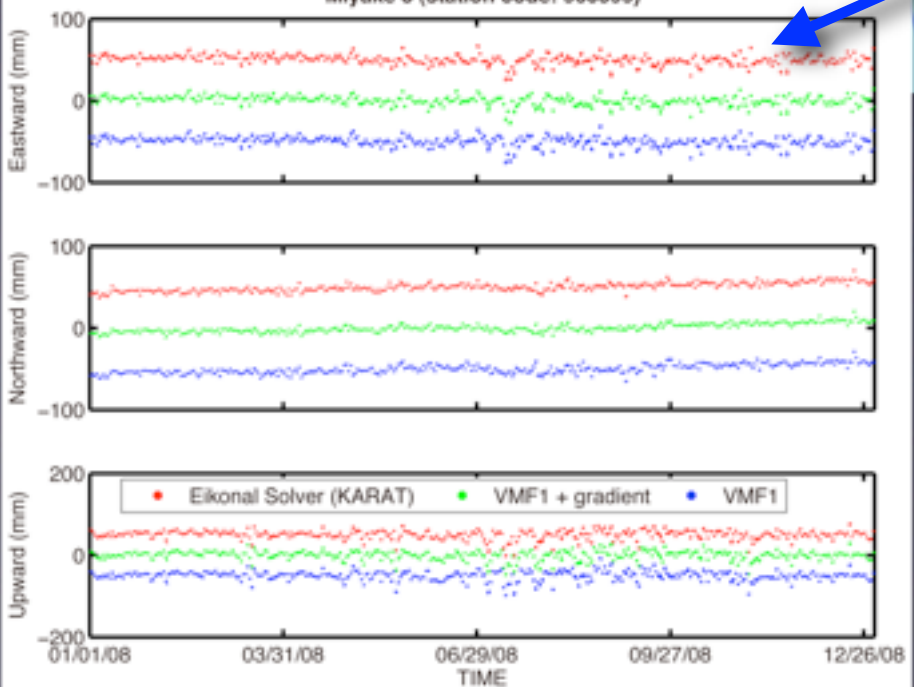
Hiraizumi (station code: 020912)



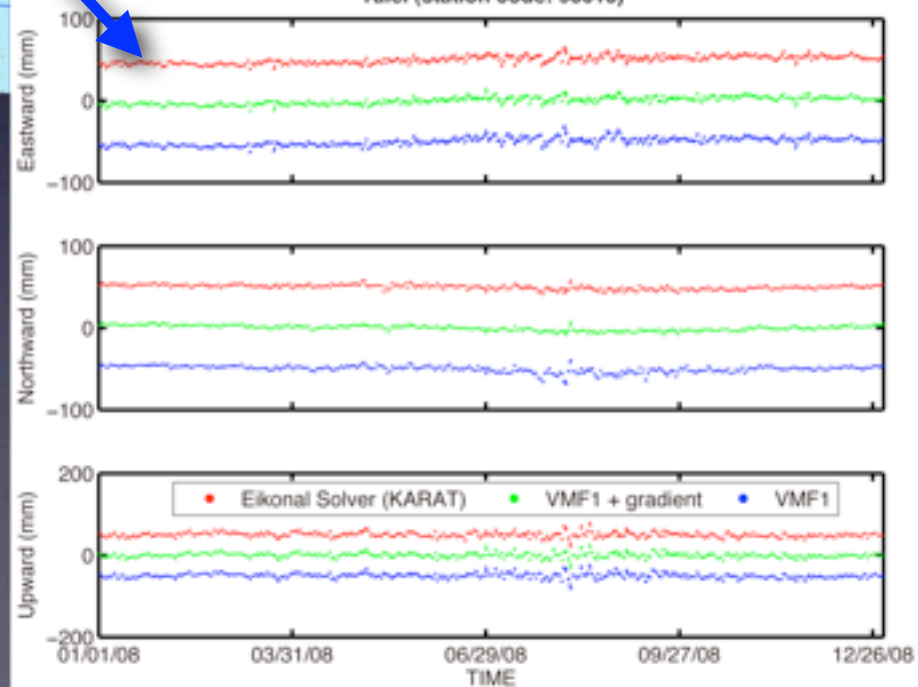
Iwate-Miyagi Nairiku Eq.



Miyake 3 (station code: 960599)

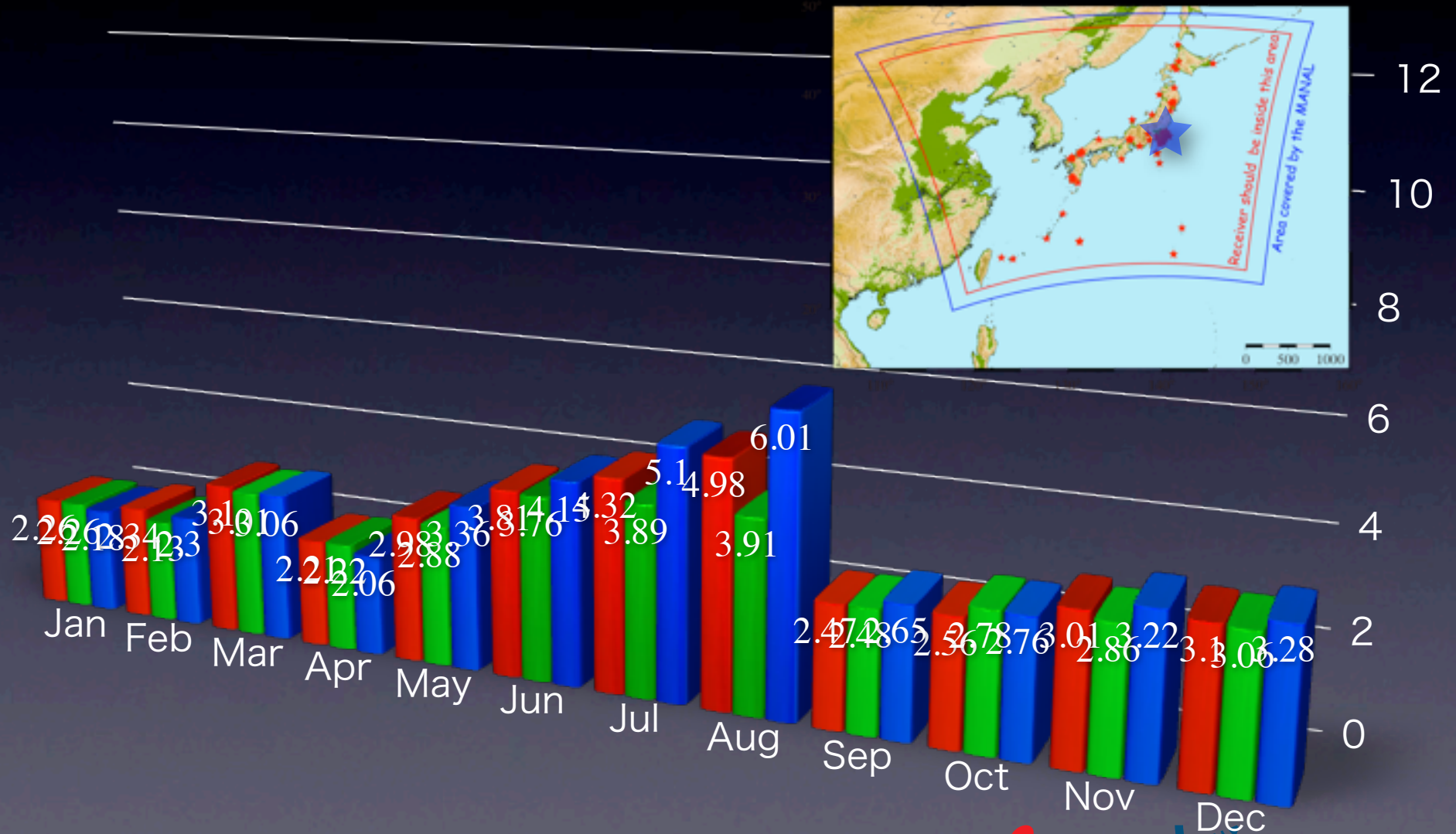


Talei (station code: 93015)

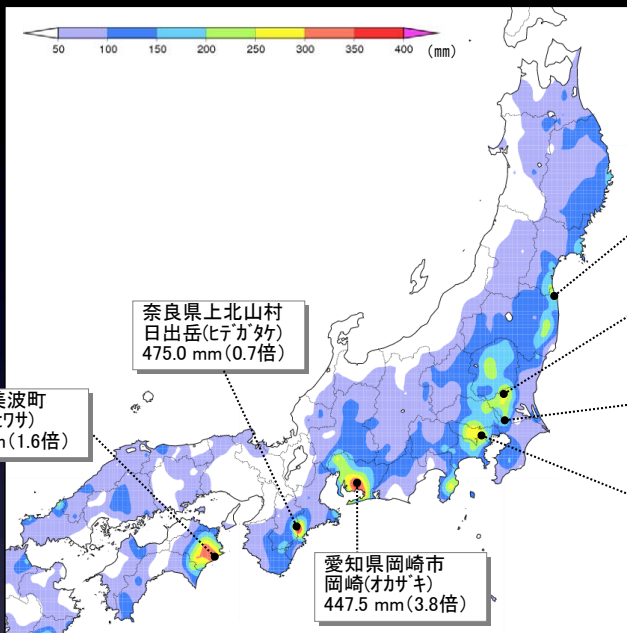


93015 -EW-

■ Eikonal EQ.
 ■ VMF1+grad
 ■ VMF1

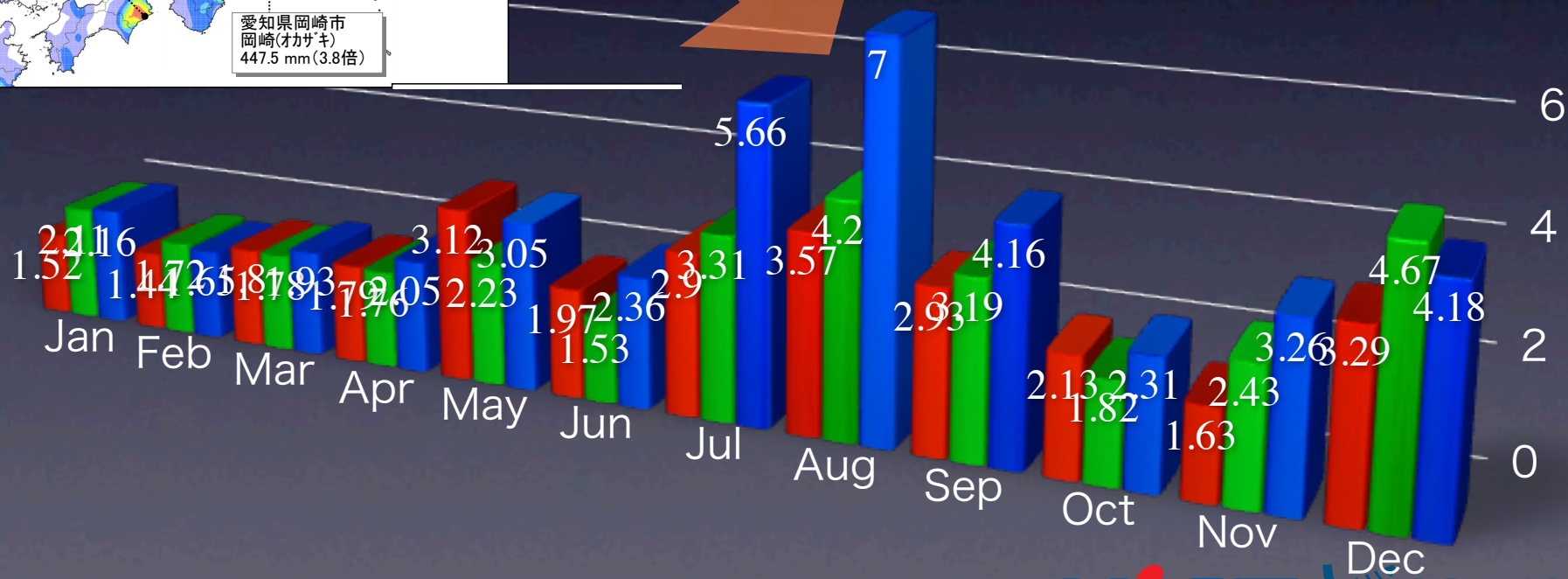


93015 -NS-



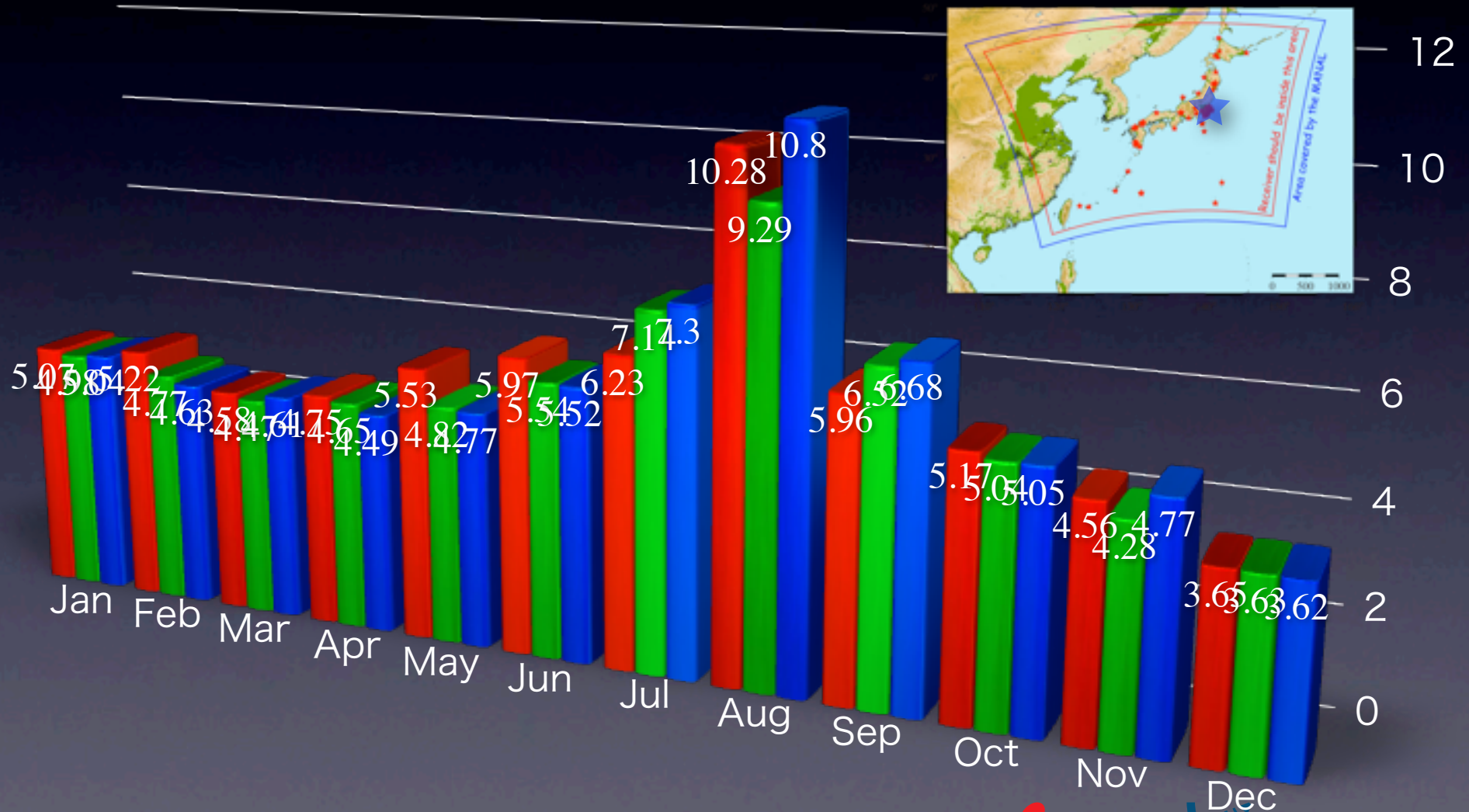
EQ. ■ VMF1+grad ■ VMF1

- 福島県相馬市 相馬(ソウマ) 245.0 mm (1.5倍)
- 茨城県筑西市 門井(カドイ) 309.5 mm (2.4倍)
- 千葉県我孫子市 我孫子(アヒコ) 254.0 mm (2.1倍)
- 東京都世田谷区 世田谷(セトヤ) 320.0 mm (1.7倍)



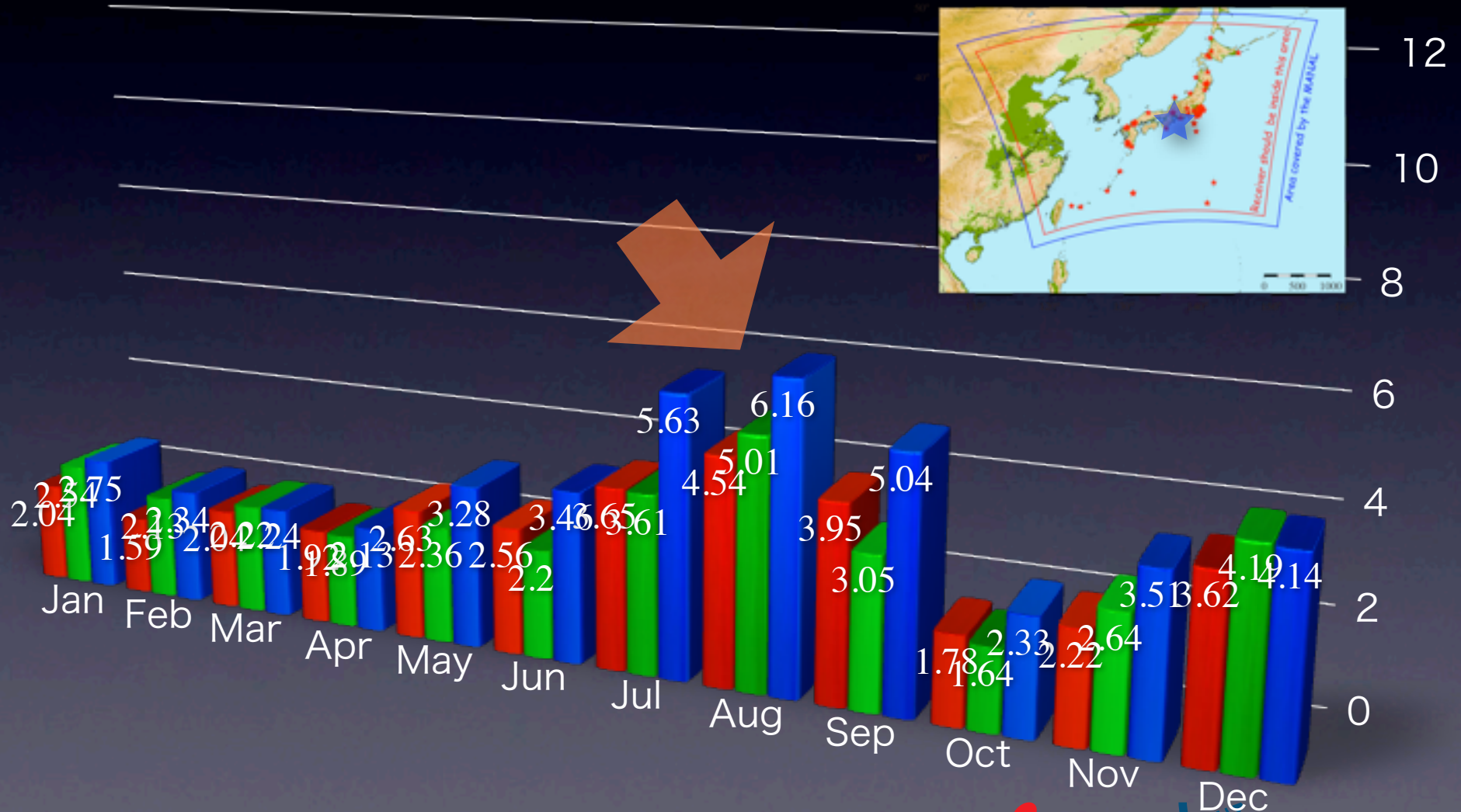
93015 -UD-

■ Eikonal EQ.
 ■ VMF1+grad
 ■ VMF1



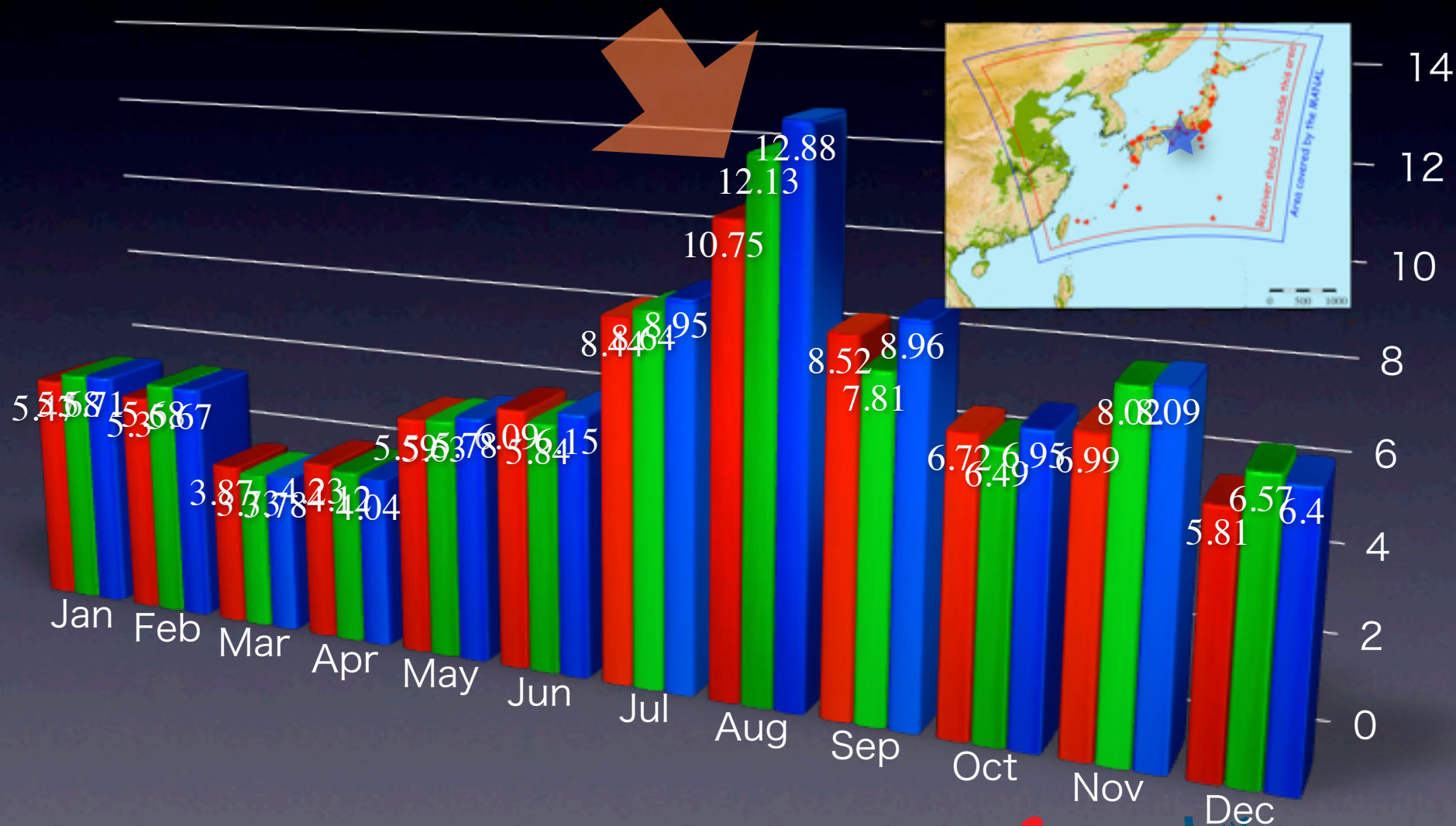
950291 -NS-

■ Eikonal EQ. ■ VMF1+grad ■ VMF1



950291 -UD-

■ Eikonal EQ. ■ VMF1+grad ■ VMF1

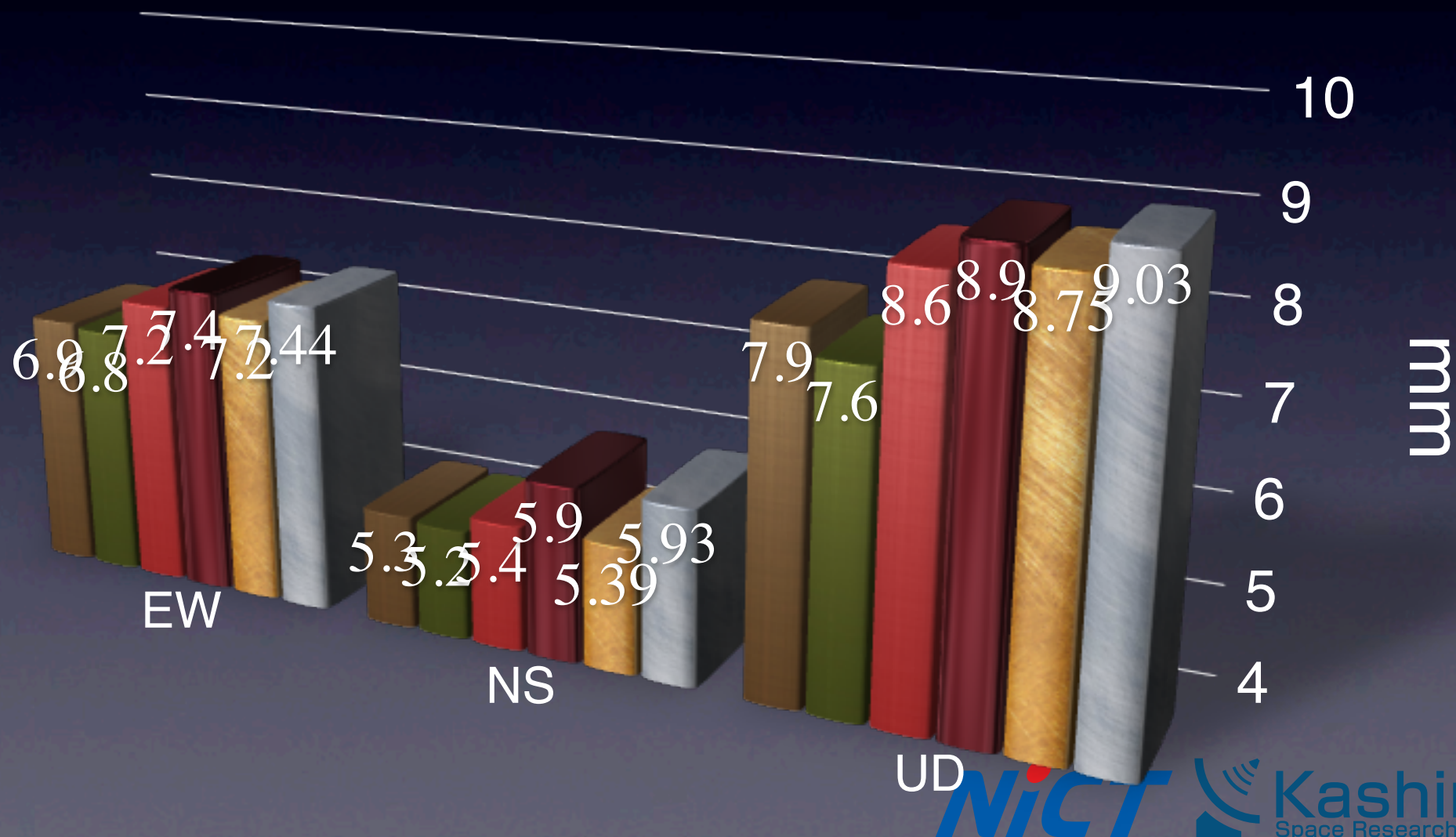


NiCT

Kashima
Space Research Center

repeatability

- Eikonal EQ (KARAT)
- Thayer Model (KARAT)
- VMF1 + grad
- VMF1
- GMF + grad
- GMF



まとめ

- 2008年1年分のGEONET57観測点データを用いてPPP解析
- JMA 10km MANALを使ったKARATはVMF1+勾配とほぼ同程度、ないしは凌駕する補正効果
- 豪雨などの大気擾乱の下で特に南北成分で顕著な補正効果あり
- Eikonal EQ.とThayer Modelでは大きな差はない

今後

- KARATの性能評価は今回で一段落
- Eikonal計算の高速化

- GPGPU技術を検討

- 5km

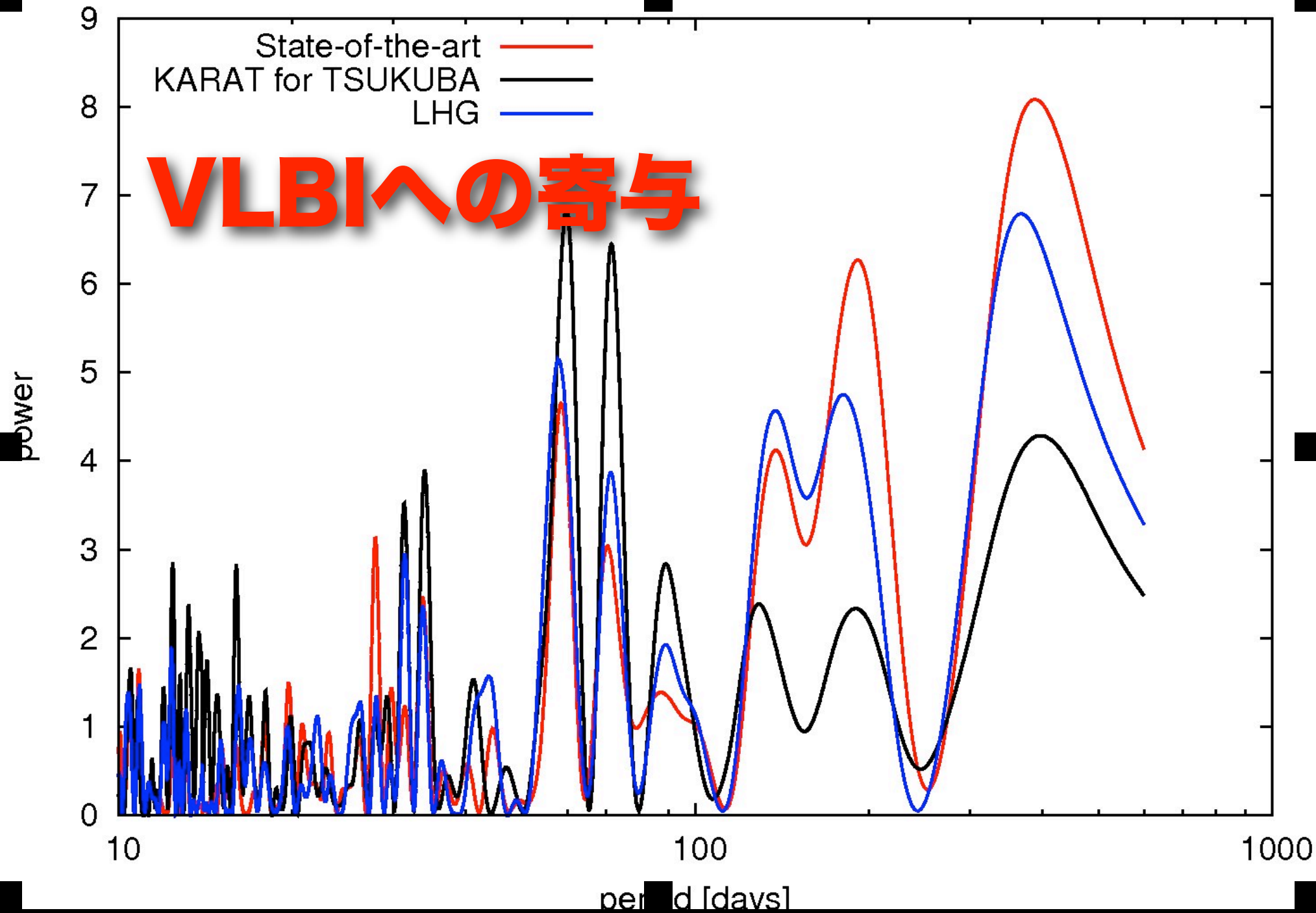
- 2009年4月5日現在、5kmの降水データの分解能が10kmから5kmに

- 2009年10月27日以降、NICTの降水データが気象庁数値予報システムに同化開始



- KARATS(KARAT計算のWEBサービス)

VLBIへの寄与



Hobiger et al.[2009]