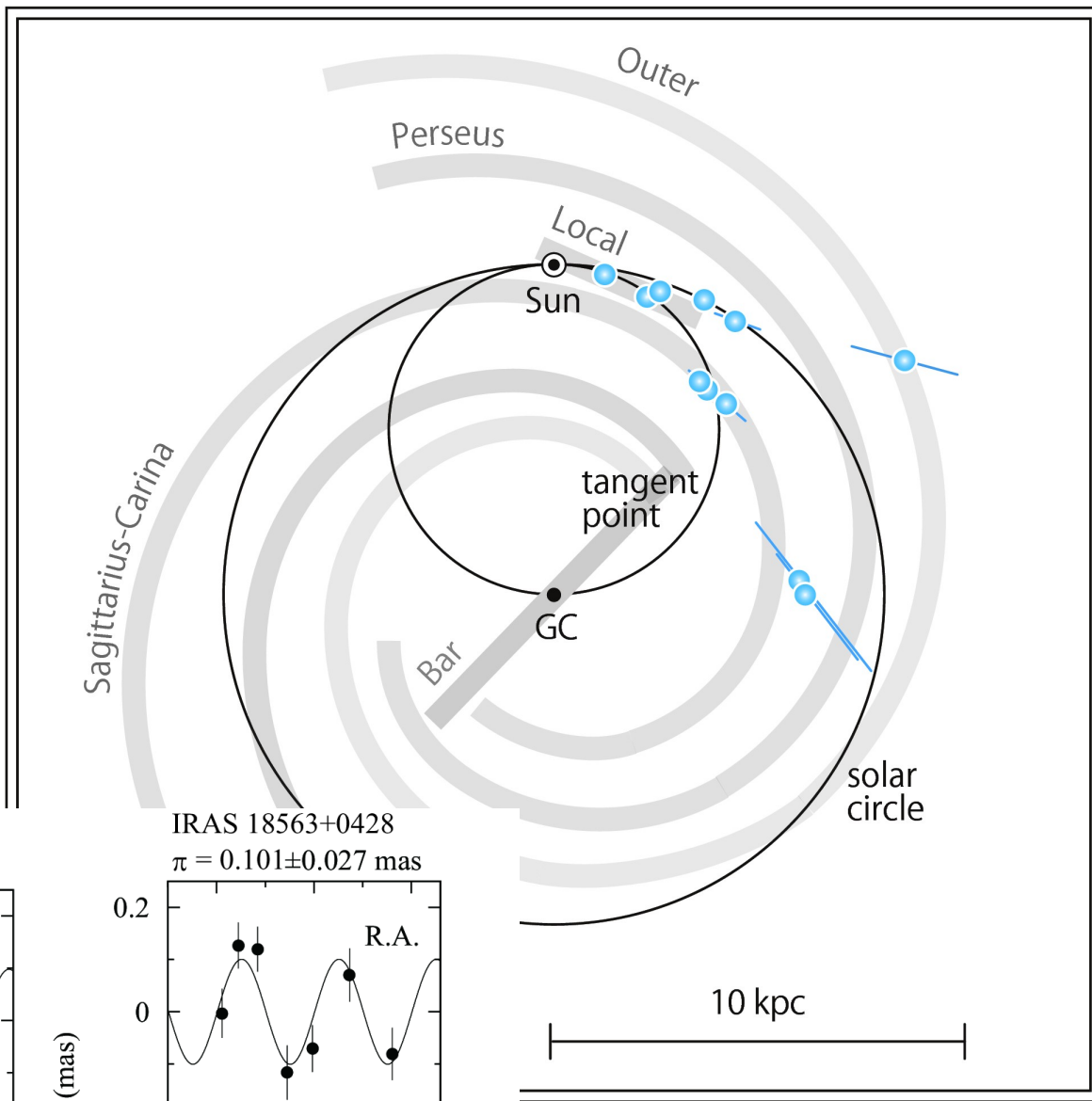
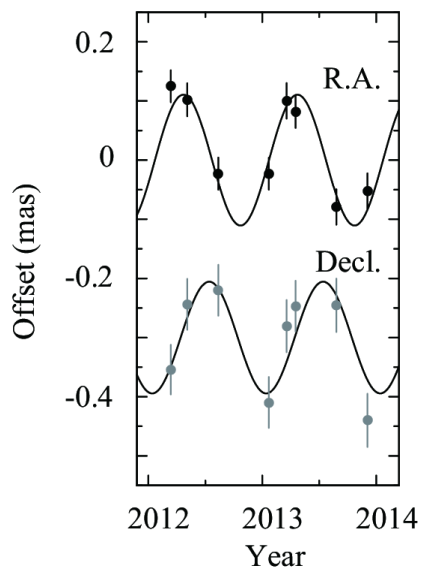


VERAによる遠方天体の位置天文観測の現状

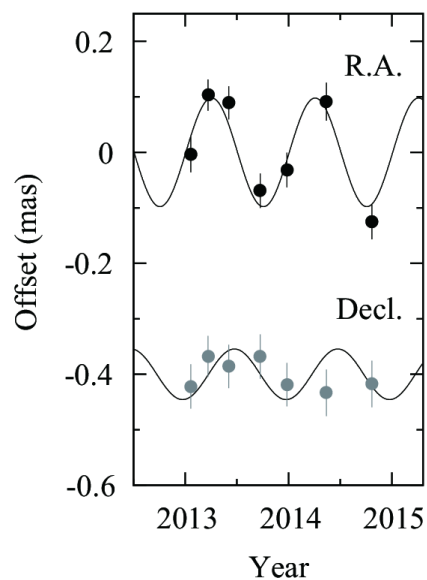
水沢VLBI観測所
永山匠



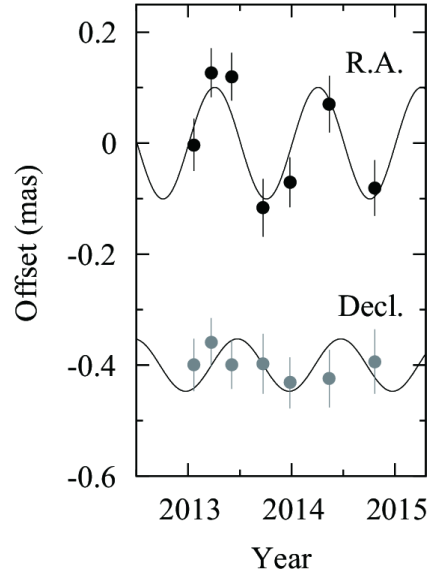
IRAS20144+3526
 $\pi = 0.113 \pm 0.016$ mas



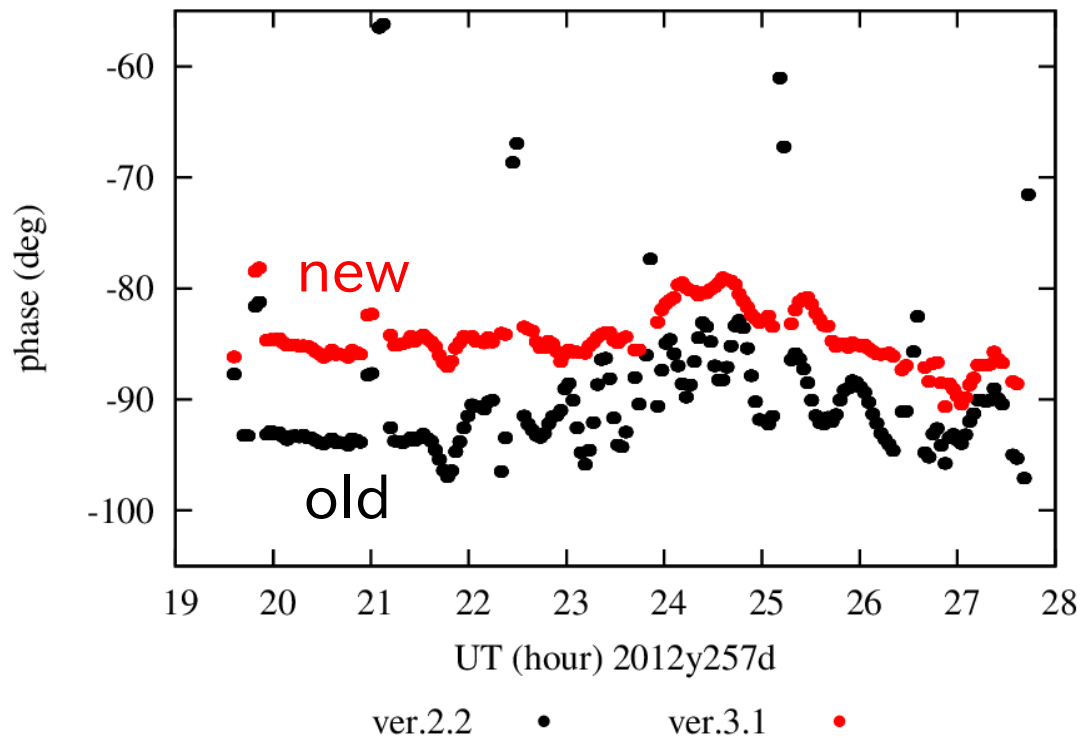
IRAS 18553+0414
 $\pi = 0.098 \pm 0.019$ mas



IRAS 18563+0428
 $\pi = 0.101 \pm 0.027$ mas



2ビーム位相の補正

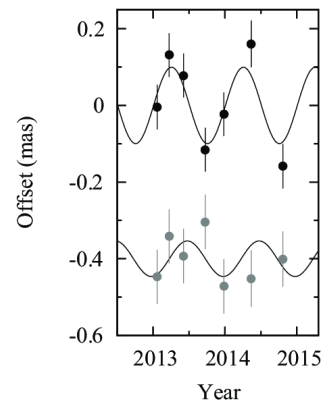


- 2B測定精度が10—20 度から数度へ改善
- 位置精度が3倍向上(100 μ as \rightarrow 30 μ as)
- 位相補償SNRは1—5倍向上
- 10 kpcの視差測定に展望(誤差15—20 %)

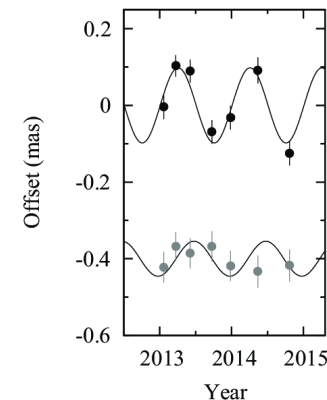
old

new

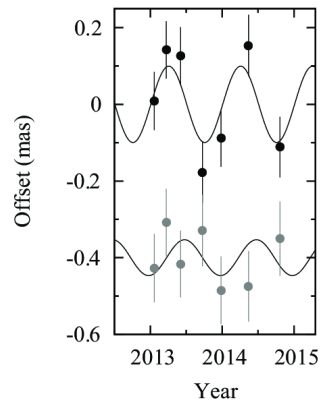
ver.2.2
 $\pi = 0.098 \text{ mas (fix)}$
 $(\alpha_x, \alpha_y) = (0.054, 0.068) \text{ mas}$



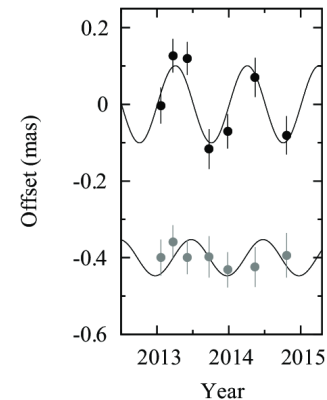
ver.3.1
 $\pi = 0.098 \pm 0.019 \text{ mas}$
 $(\alpha_x, \alpha_y) = (0.032, 0.042) \text{ mas}$



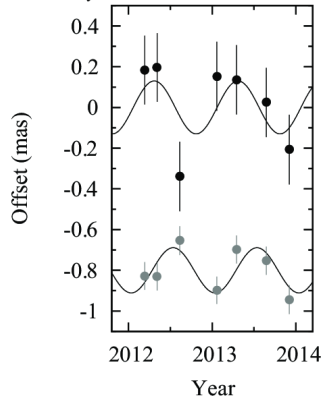
ver.2.2
 $\pi = 0.101 \text{ mas (fix)}$
 $(\alpha_x, \alpha_y) = (0.072, 0.085) \text{ mas}$



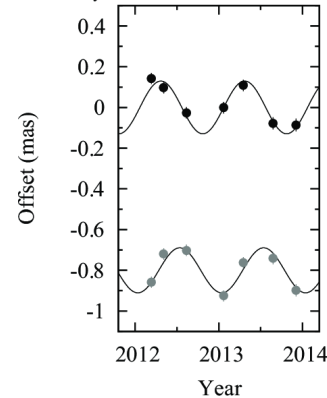
ver.3.1
 $\pi = 0.101 \pm 0.027 \text{ mas}$
 $(\alpha_x, \alpha_y) = (0.045, 0.045) \text{ mas}$



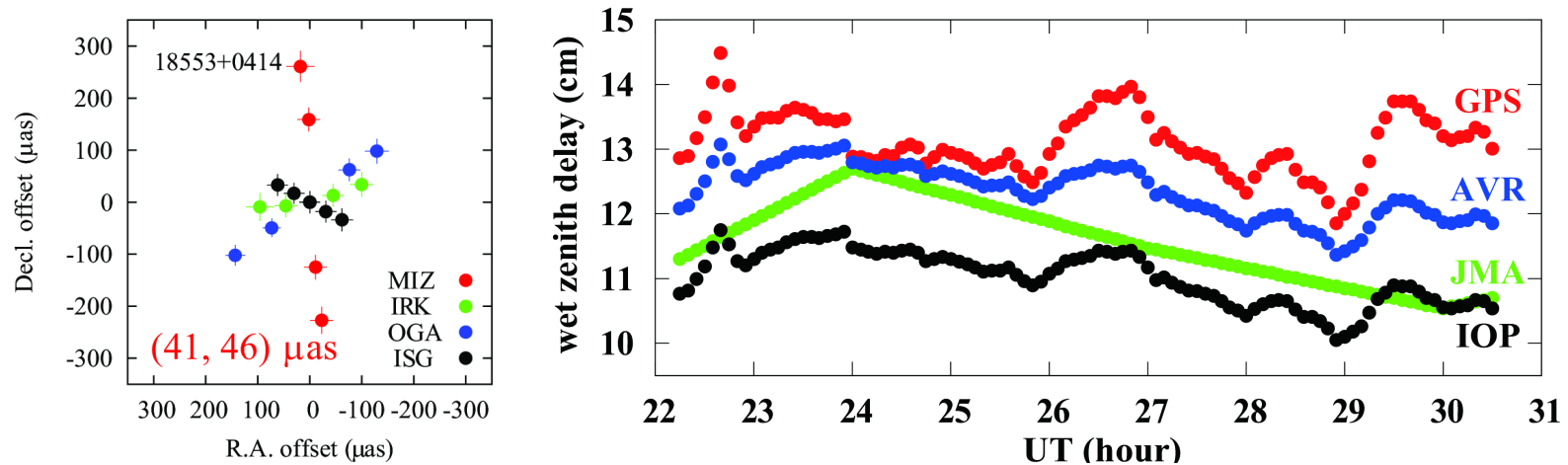
ver.2.2
 $\pi = 0.133 \text{ mas (fix)}$
 $(\alpha_x, \alpha_y) = (0.169, 0.067) \text{ mas}$



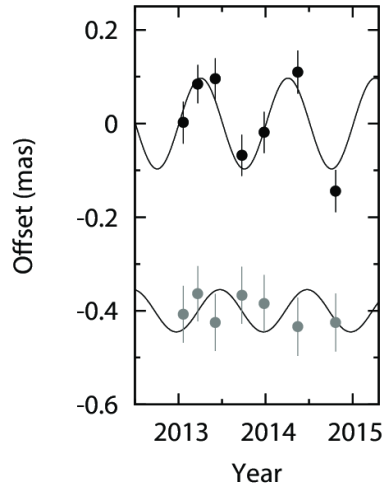
ver.3.1
 $\pi = 0.133 \pm 0.014 \text{ mas}$
 $(\alpha_x, \alpha_y) = (0.027, 0.027) \text{ mas}$



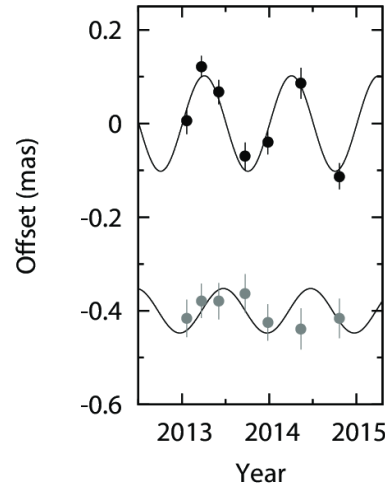
大気遅延の補正



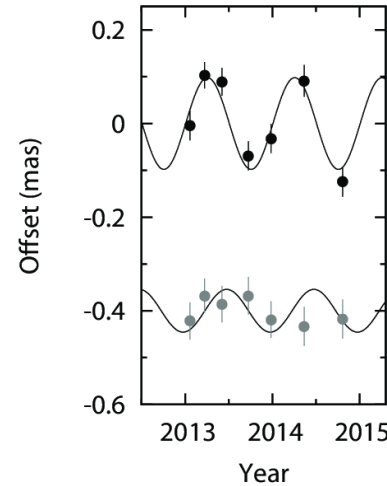
GPS
 $\pi = 0.097\text{--}0.024 \text{ mas}$
 $(\alpha_x, \alpha_y) = (0.039, 0.057) \text{ mas}$



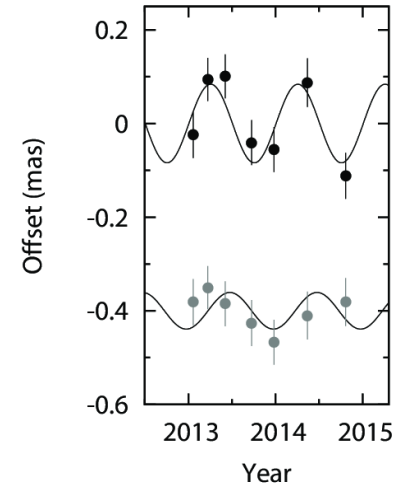
JMA
 $\pi = 0.103\text{--}0.017 \text{ mas}$
 $(\alpha_x, \alpha_y) = (0.025, 0.043) \text{ mas}$



AVR
 $\pi = 0.098\text{--}0.019 \text{ mas}$
 $(\alpha_x, \alpha_y) = (0.032, 0.042) \text{ mas}$



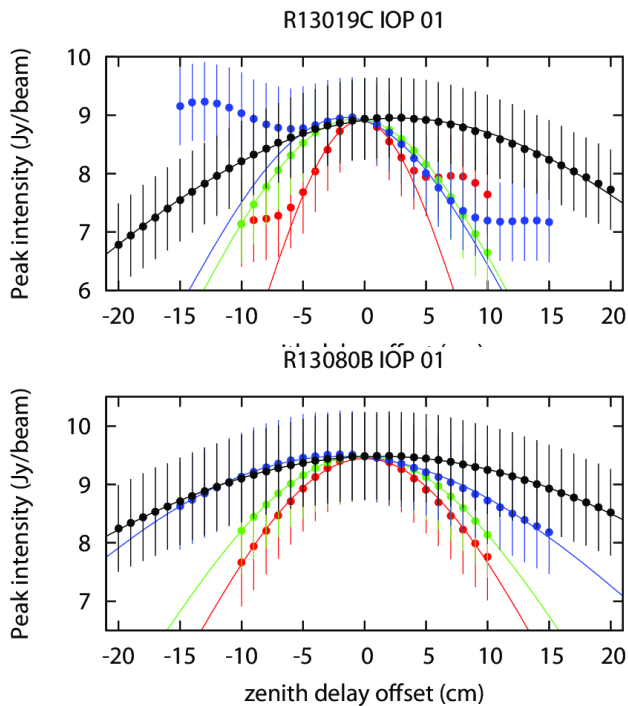
IOP
 $\pi = 0.084\text{--}0.026 \text{ mas}$
 $(\alpha_x, \alpha_y) = (0.047, 0.045) \text{ mas}$



- 赤緯10度以下の低仰角天体は、mmの天頂大気測定精度が必要。
- GPS、JMA(気象庁データ)、どの方法でも、視差、精度が同じ。

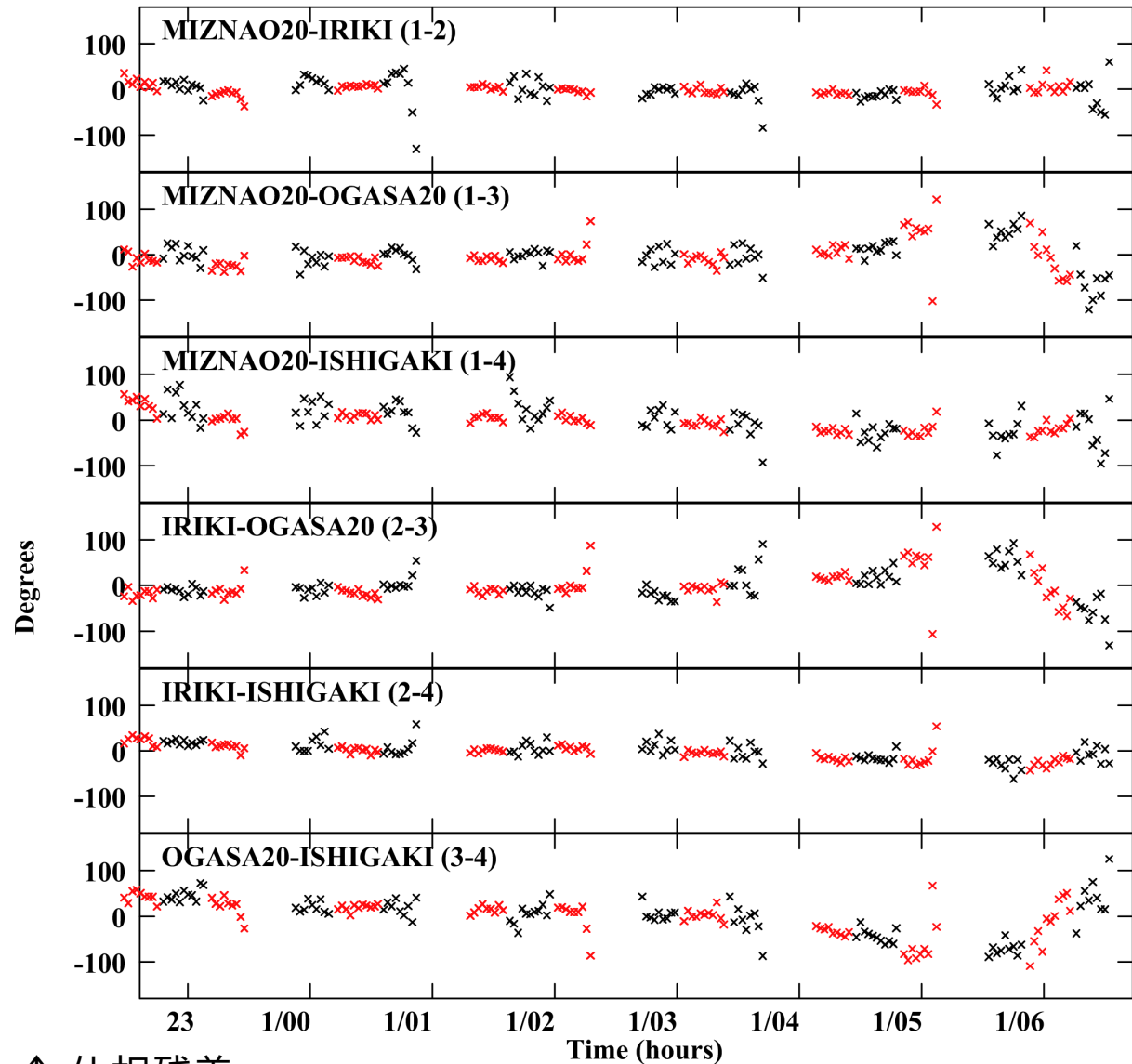
現在の課題

- 不明な位相オフセットの改善
 - 特定の時間帯、局にオフセット
 - 改善できれば、IOPで大気補正が向上
- Ray trace, Slant TEC導入
 - 視線方向の遅延を直接求める
 - 大気: Ray trace
 - 電離層: Slant TEC



PLot file version 1 created 05-JUN-2015 10:31:29
 Phase vs Time for 18553+04.SPLIT.1 Vect aver.
 IF 1 CHAN 1 STK LL

18553+04
 18563+04



↑ 位相残差

← Image optimization (IOP)の例

VERAによる遠方天体の 位置天文観測の現状

- 現状

- 2ビーム位相、大気遅延の補正の見直しで、位置精度が3倍向上($100\mu\text{as} \rightarrow 30\mu\text{as}$)
- 赤緯も赤経と同程度の精度が出る
- 10 kpcの距離測定に展望 (誤差15—20%)

- 今後

- 不明な位相オフセットの解明、改善
- 大気Ray trace, 電離層Slant TECの導入