# Phase Observables
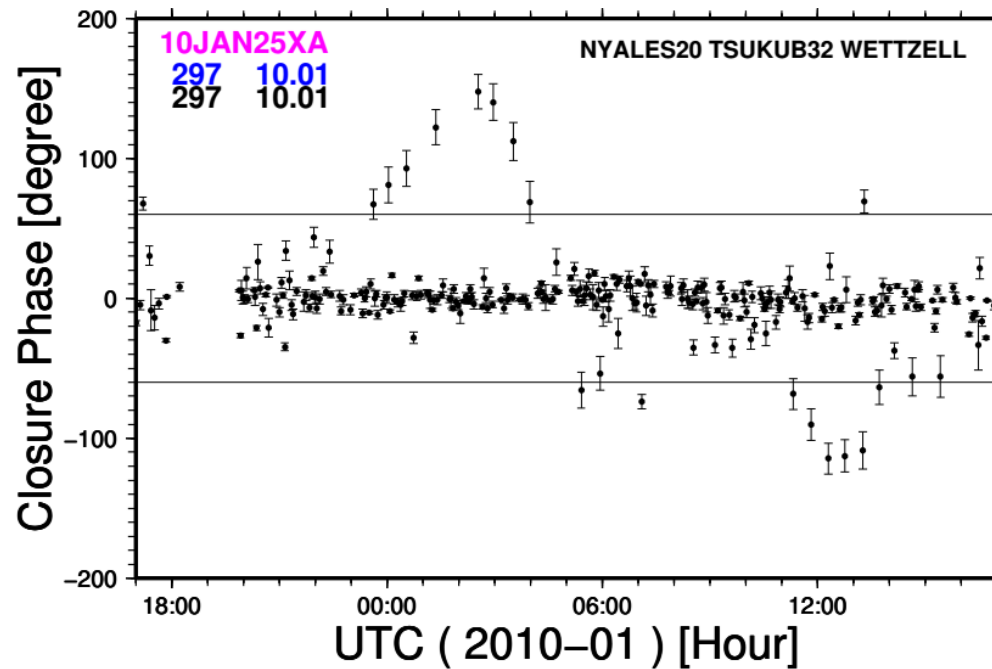
Minghui Xu  & James M. Anderson

# Phase
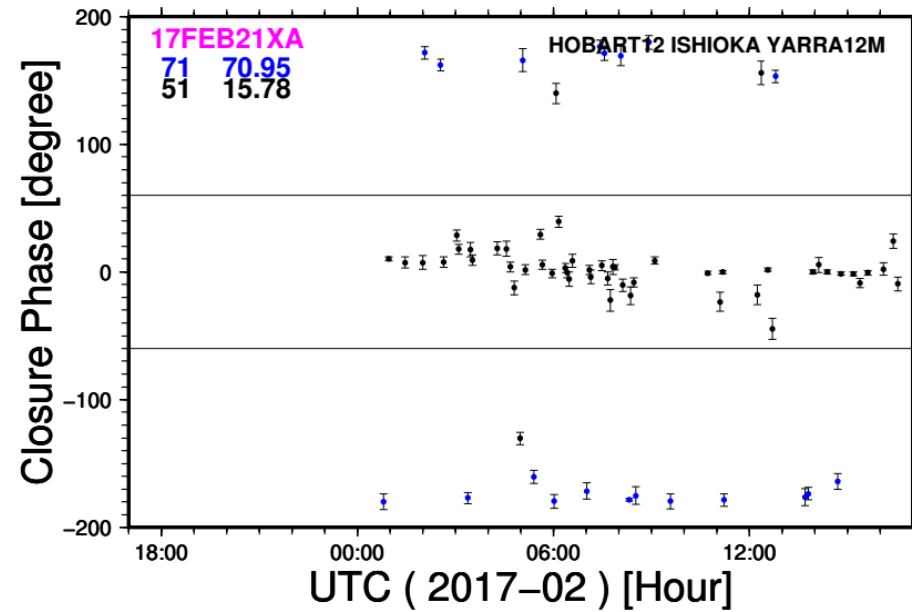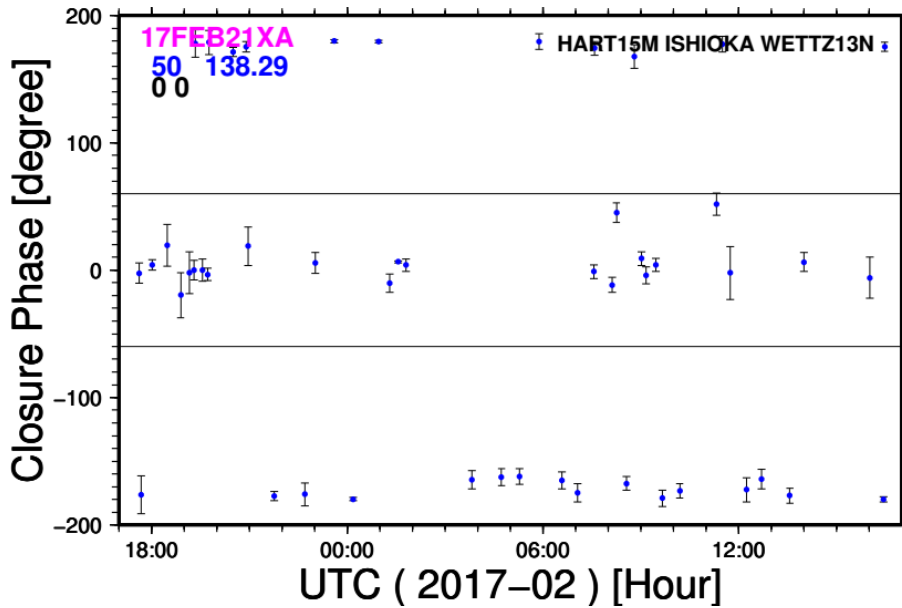
## ☐ **Phase observables**

Good case for **one** triangle of **all** sources in **one** session:
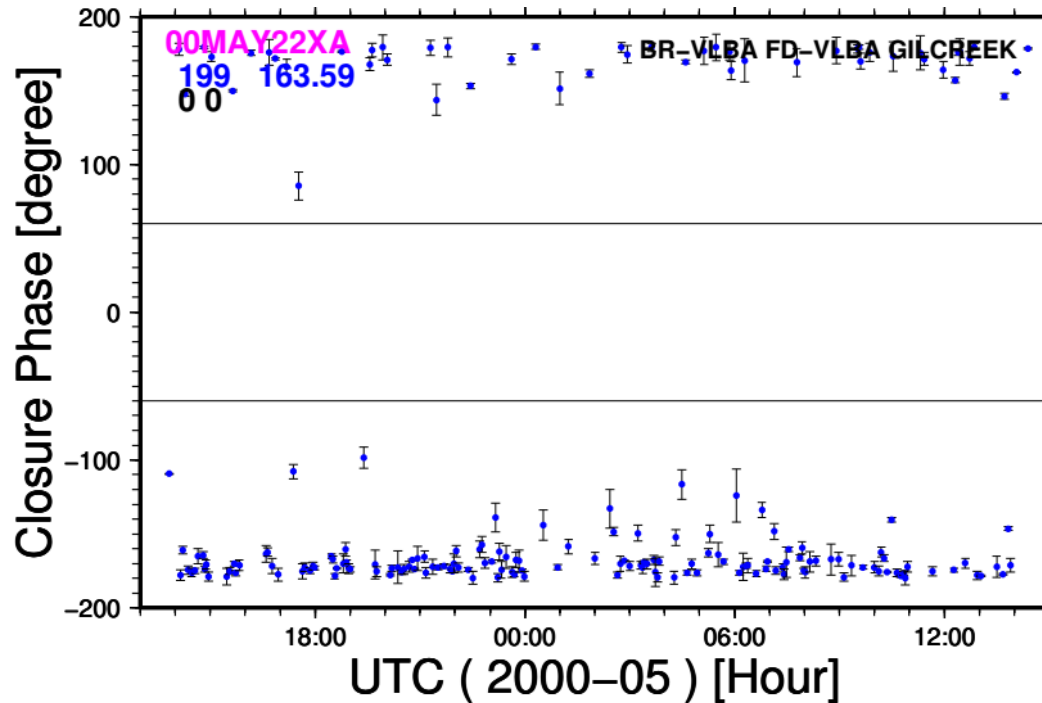
# Phase

☐ **180 degrees**

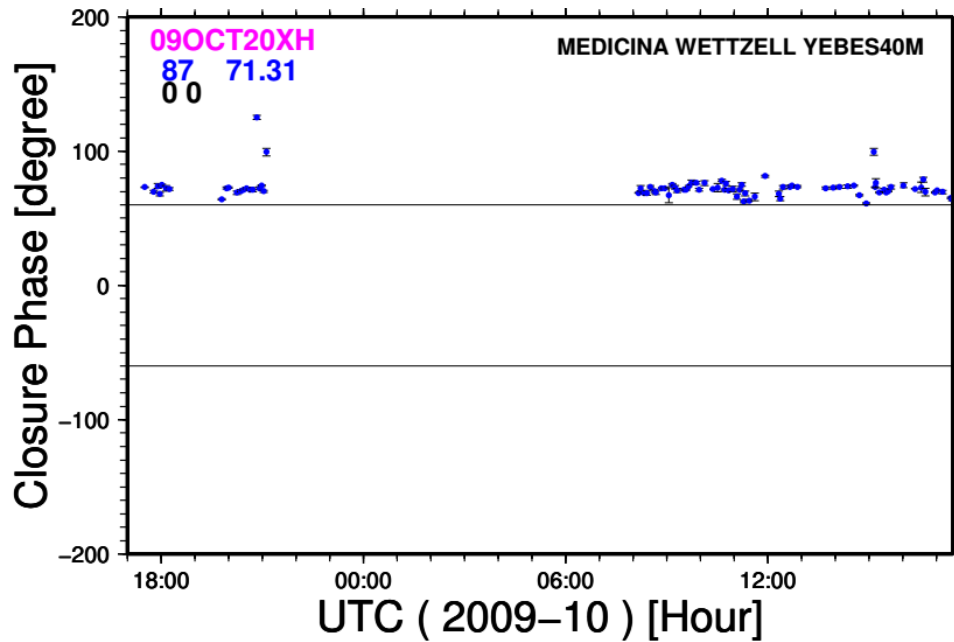This case has happened for R1 and R4 sessions after 2016

# Phase

☐ 180 degrees
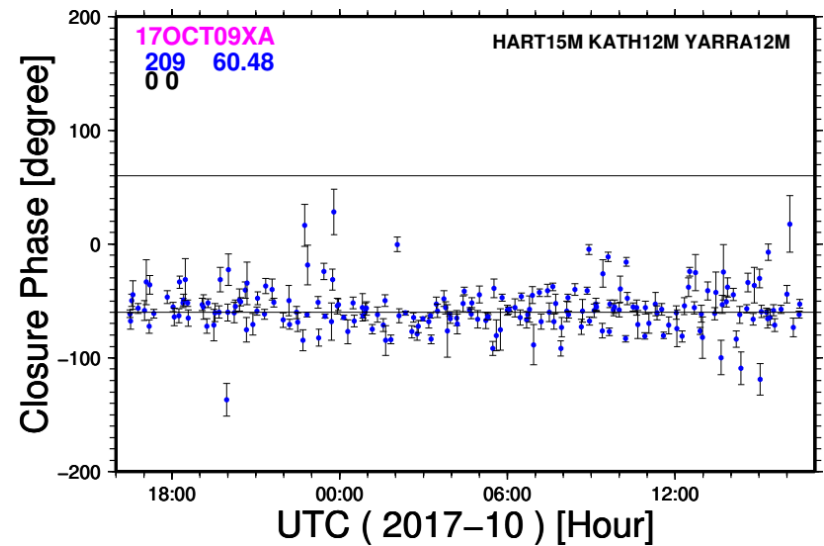
This case has happened for some VLBA + sessions
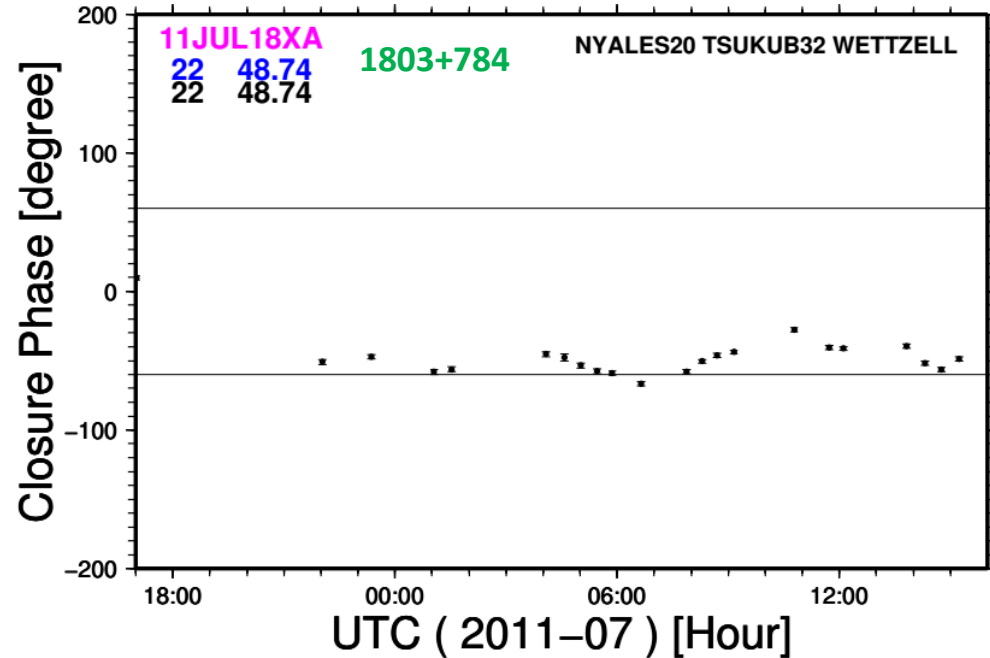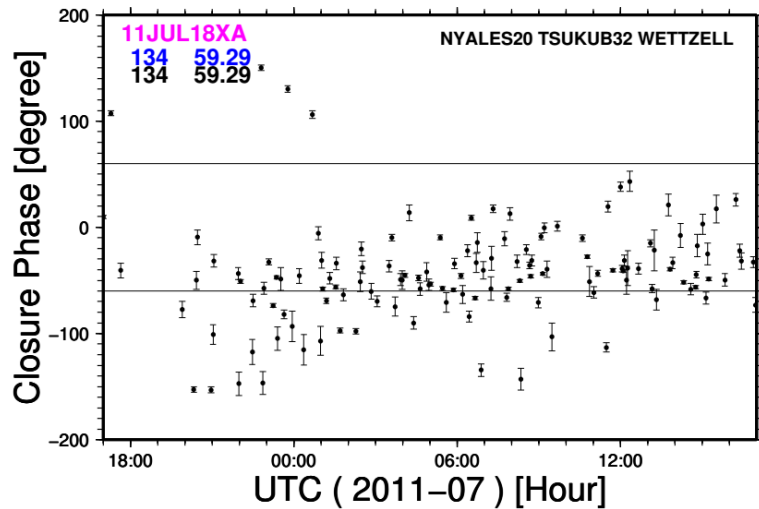
# Phase

☐ **Constant Offsets**



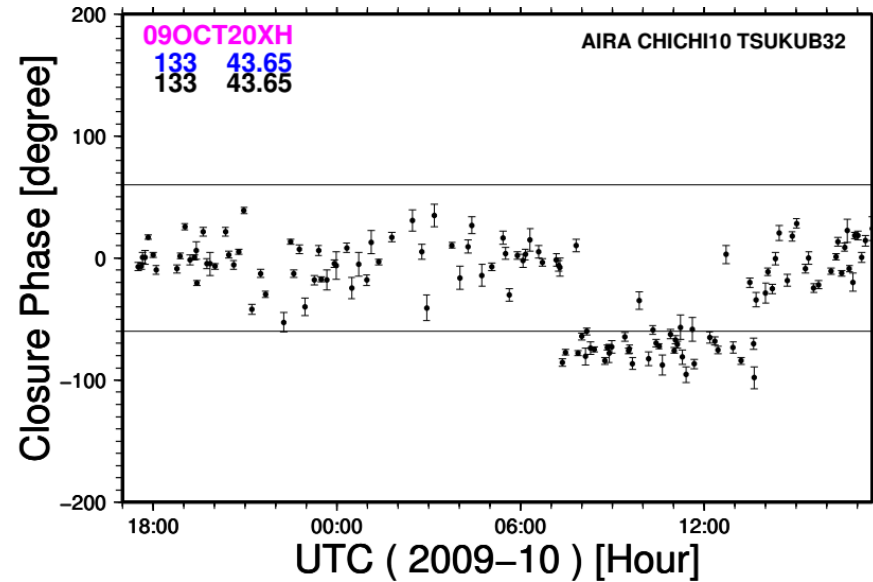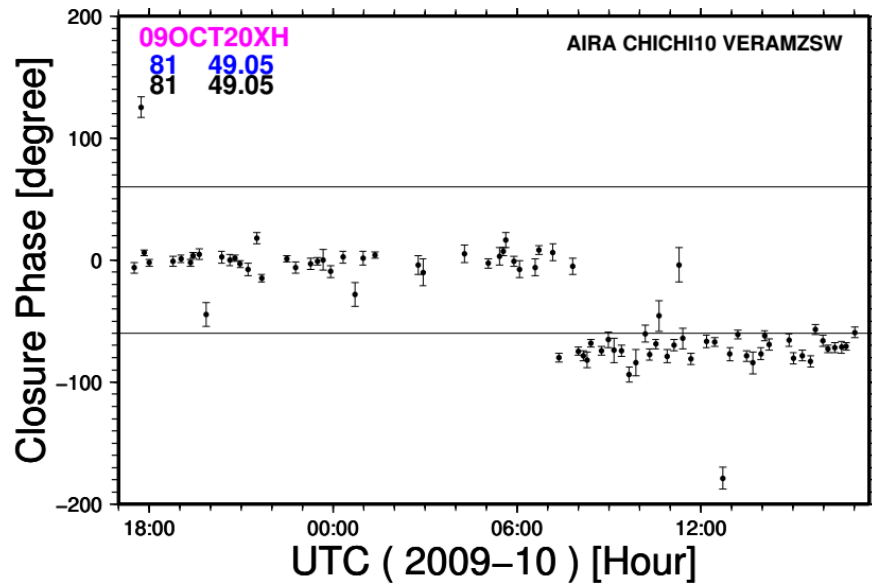This case has happened for XH (TRF) sessions.
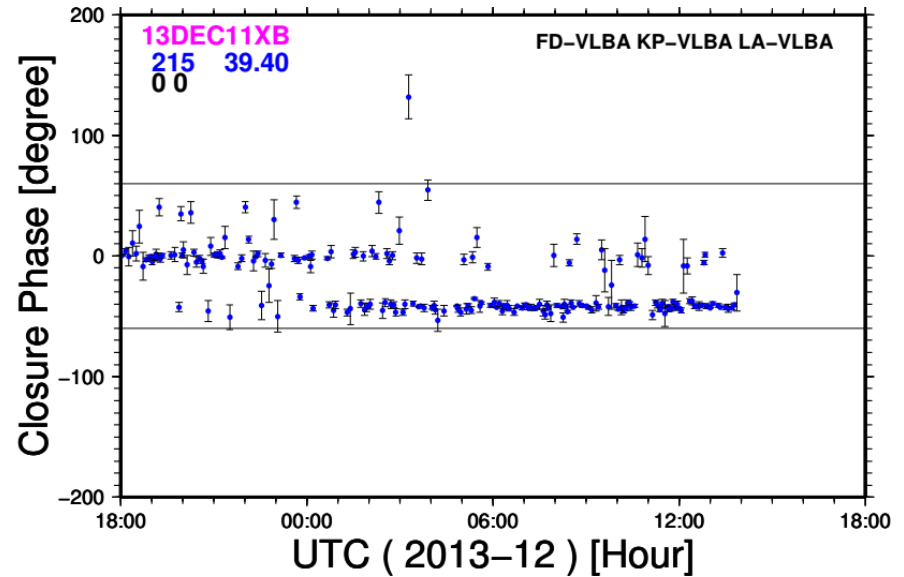
# Phase

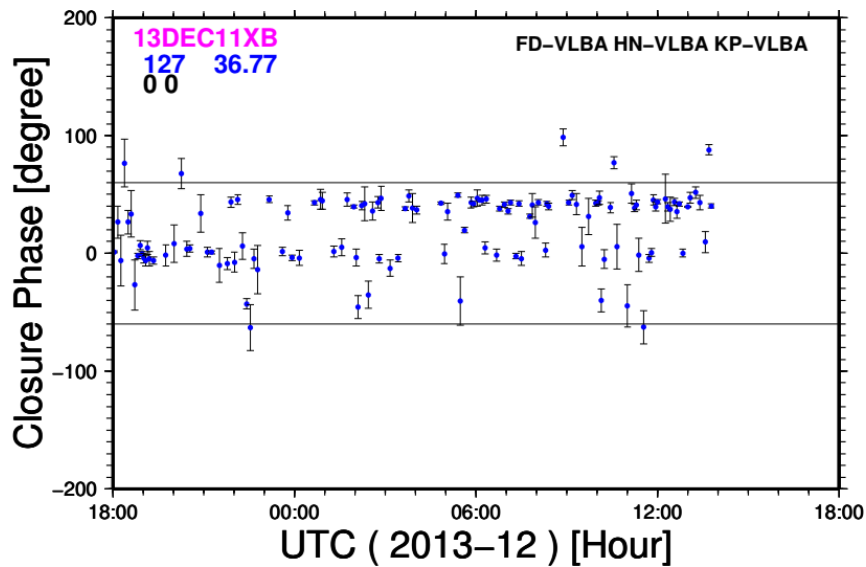☐ Constant offsets

3. Constant offsets:

# Phase

☐ Constant offsets

# Phase

☐ Constant offsets (part-scans):

# Phase

☐ Random-like values
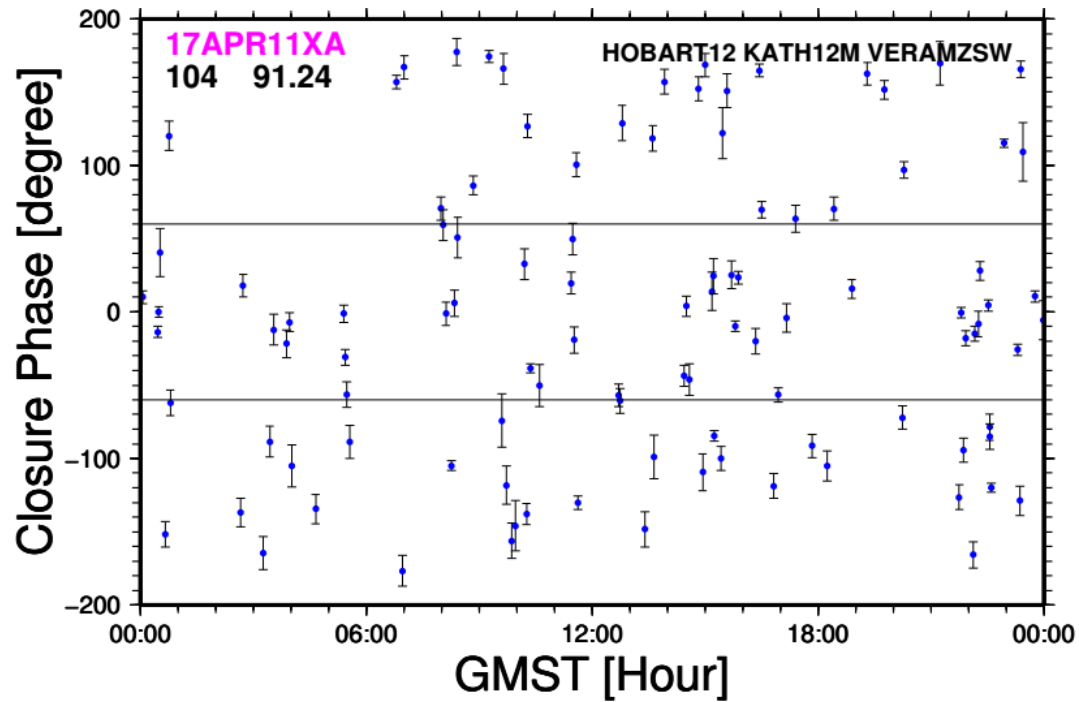
# Phase

☐ Random-like values
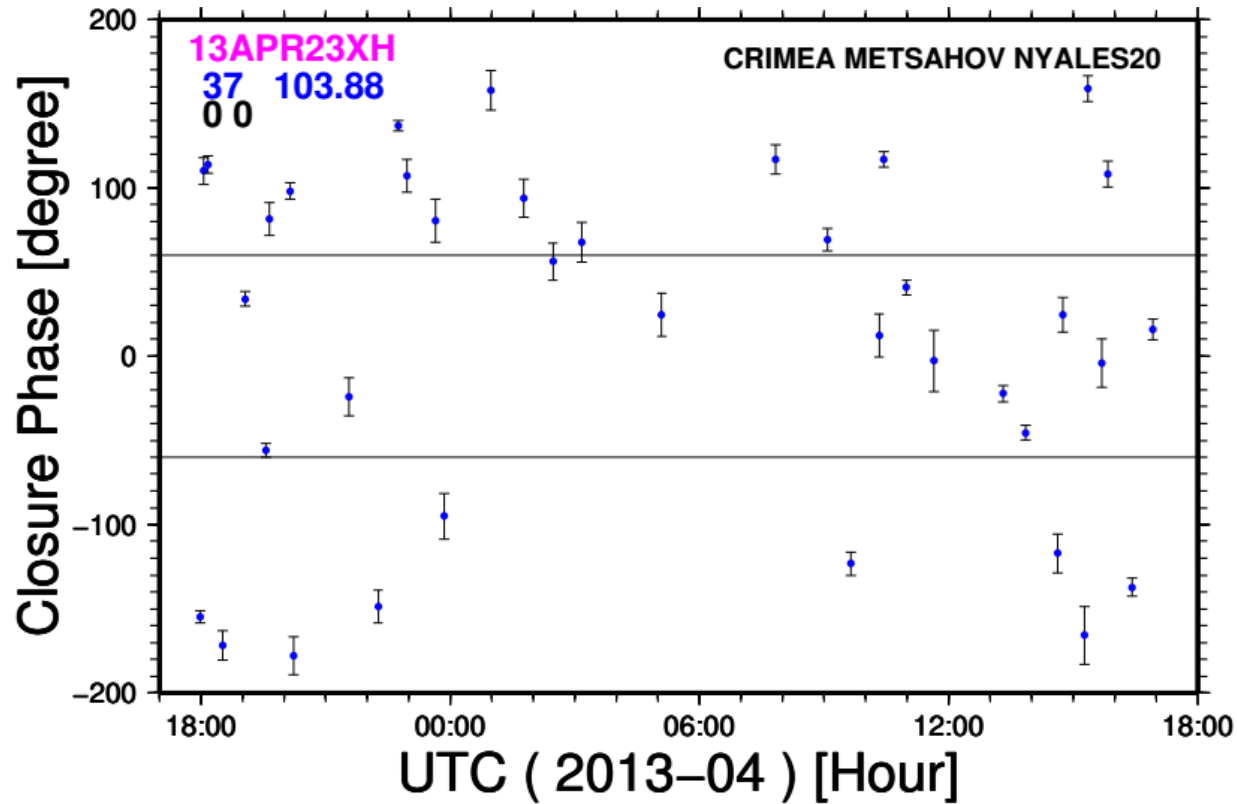
# Thank you very much

# Understanding Closures

## □ Delay and Phase (and Rate)

Real calculations based on real observables are more complicate than the concepts

$$\tau_{clr} = \tau_{ab} + \tau_{bc} + \tau_{ca}$$

$$\tau_{bc}: +\tau'_{ab} \cdot \dot{\tau}_{bc} + \dots$$

$$\varphi_{clr} = \varphi_{ab} + \varphi_{bc} + \varphi_{ca}$$

$$\varphi_{bc}: +2\pi f (\tau'_{ab} \cdot \dot{\tau}_{bc} + \dots)$$

# Understanding Closures

☐ **Delay and Phase (and Rate)**

Take reference frequency for phase as an example:

| # of obs. | Freq (MHz) |
|----------:|-----------:|
| 7,446,197 | 8212.99 |
| 2,482,801 | 8210.99 |
| 989,009 | 8409.99 |
| 682,045 | 8182.99 |
| 261,897 | 8365.75 |
| 214,452 | 8405.99 |
| 211,713 | 8460.00 |
| 117,655 | 8152.49 |
| 100,996 | 8154.49 |
| 80,219 | 8204.99 |

$$\varphi_{clr} = \varphi_{ab} + \varphi_{bc} + \varphi_{ca}$$

$$\varphi_{bc}: \ +2\pi f \left(\tau'_{ab} \cdot \dot{\tau}_{bc} + \ldots\right)$$