



Multi-Constellation Augmentation Service System (MASS) In China

Chuang Shi

GNSS Research Center, Wuhan University

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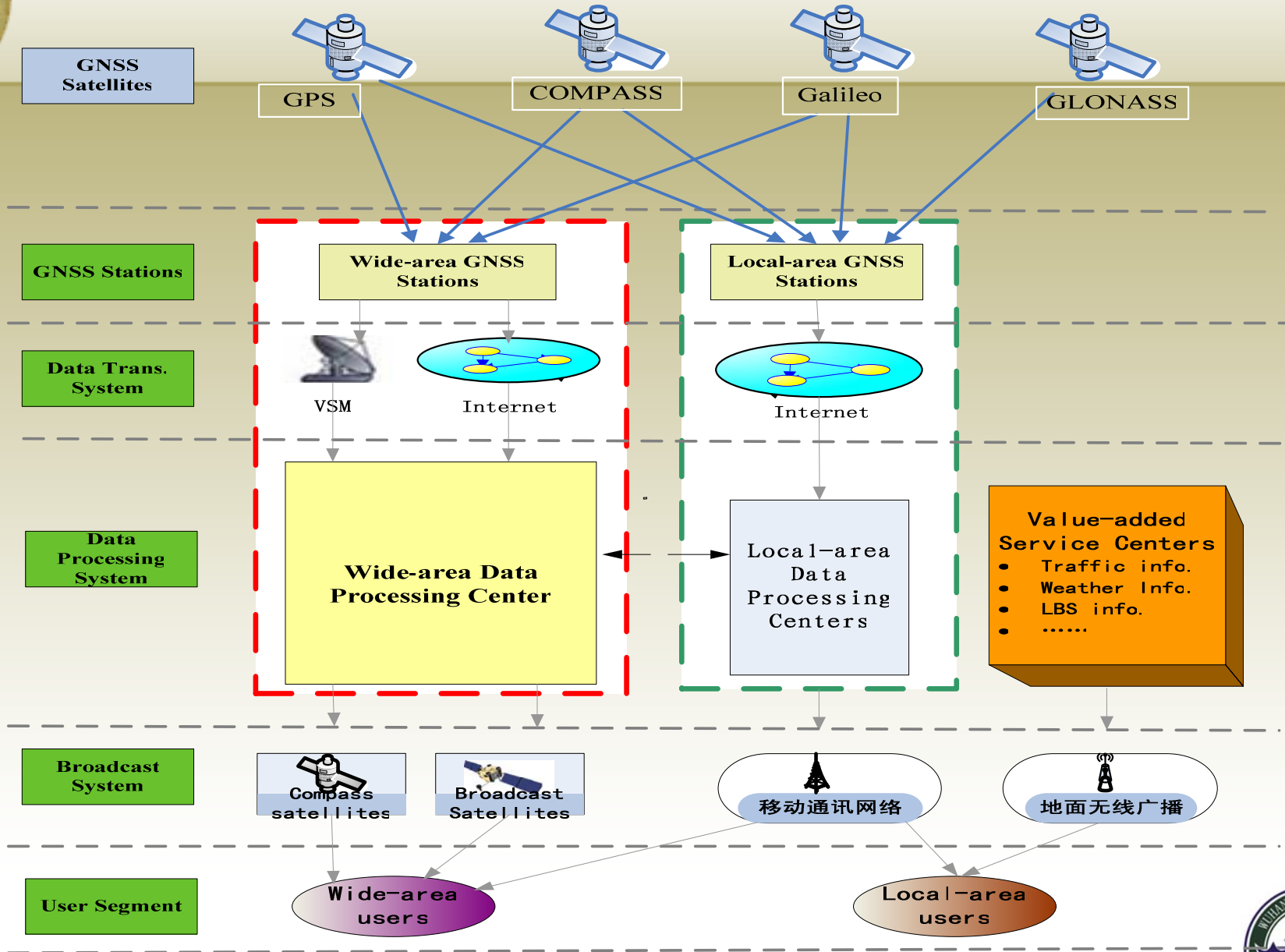


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Multi-constellation Augmentation Service System(MASS)





Positioning and Navigation Performance

Wide Area:

- **Dual frequency : $< 0.3\text{m}$ (After initialized, RT, K)**
- **Single frequency: $< 1\text{ m}$ (RT, K)**
- **Value-added service**

Local Area:

- **Dual frequency : $< 0.03\text{m}$ (After initialized , RT, K)**
- **Single frequency : $< 0.3\text{m}$ (RT, K)**
- **Value-added service**





PANDA Software

***PANDA* : *P*ositioning *A*nd *N*avigation *D*ata *A*nalyst**

- **To derive possible information from GNSS/SLR/VLBI data in real-time and post-mission**
- **Developed at Wuhan University since 2001**
- **Current Applications**
 - **POD of GNSS (COMPASS, GPS, Galileo)**
 - **POD of LEOs (CHAMP, GRACE, COSMIC , ...)**
 - **Huge Network**
 - **PPP**
 - **.....**





New Development: Real-Time

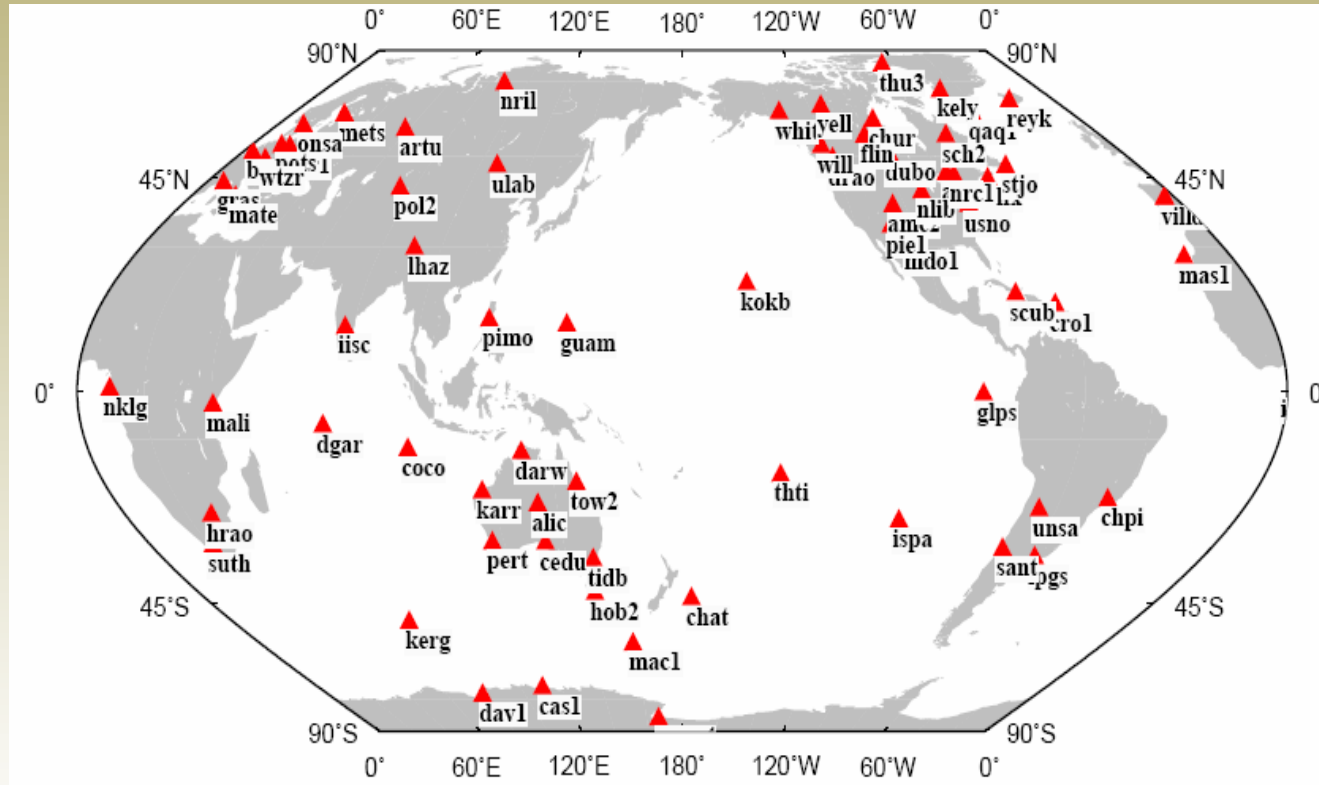
- **PPP Based Positioning Service System**
 - Real-time GPS orbits
 - Real-time GPS Satellite Clock Offsets
 - Precise Point Positioning





Preliminary Results

Test Network



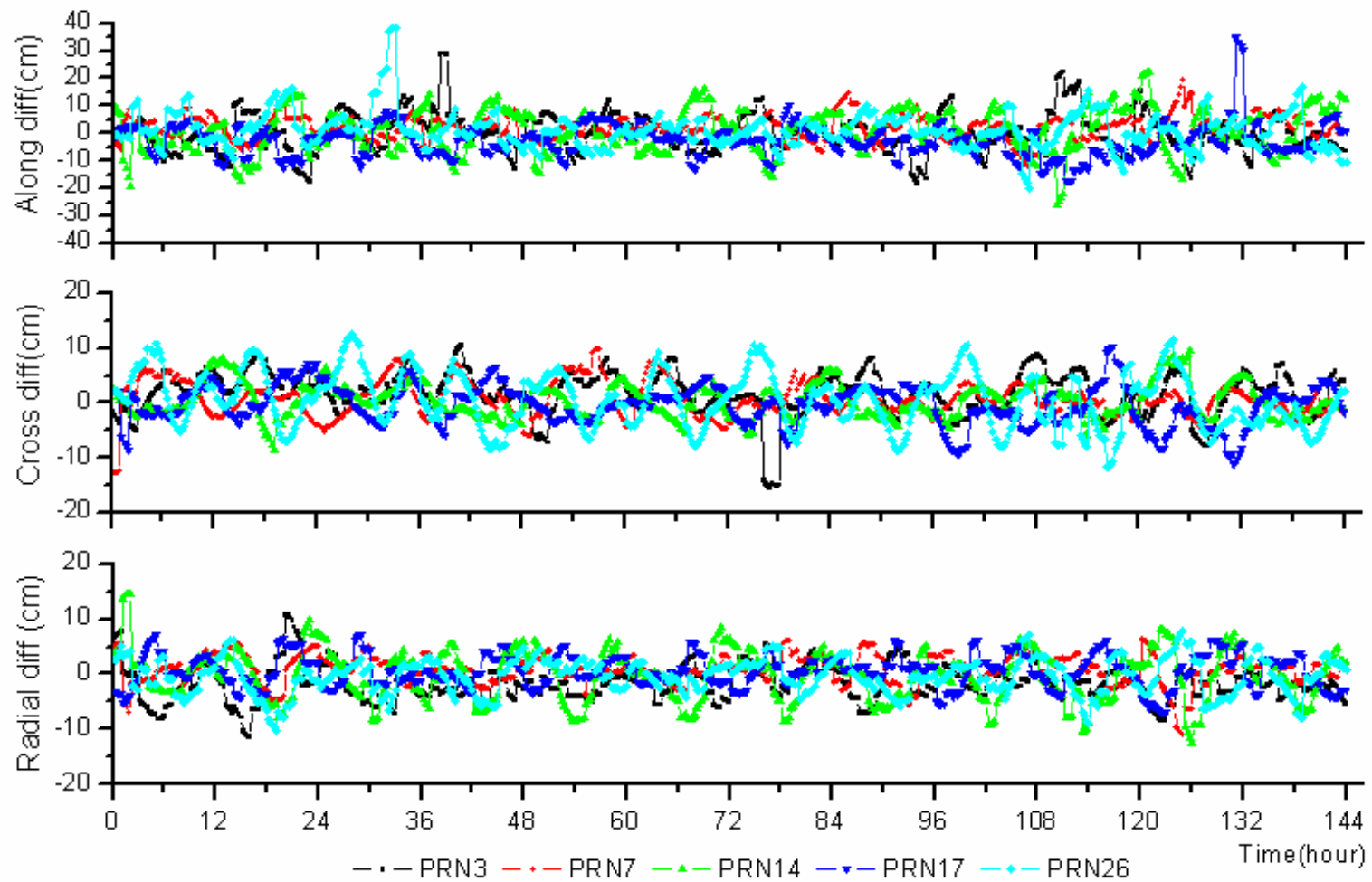
The distribution of the 70 IGS stations for Real time satellite orbit determination (70stations)

Rinex data are inputted as stream through simulated real-time model





Result of RT-POD (Hourly predicted) vs IGS Finals

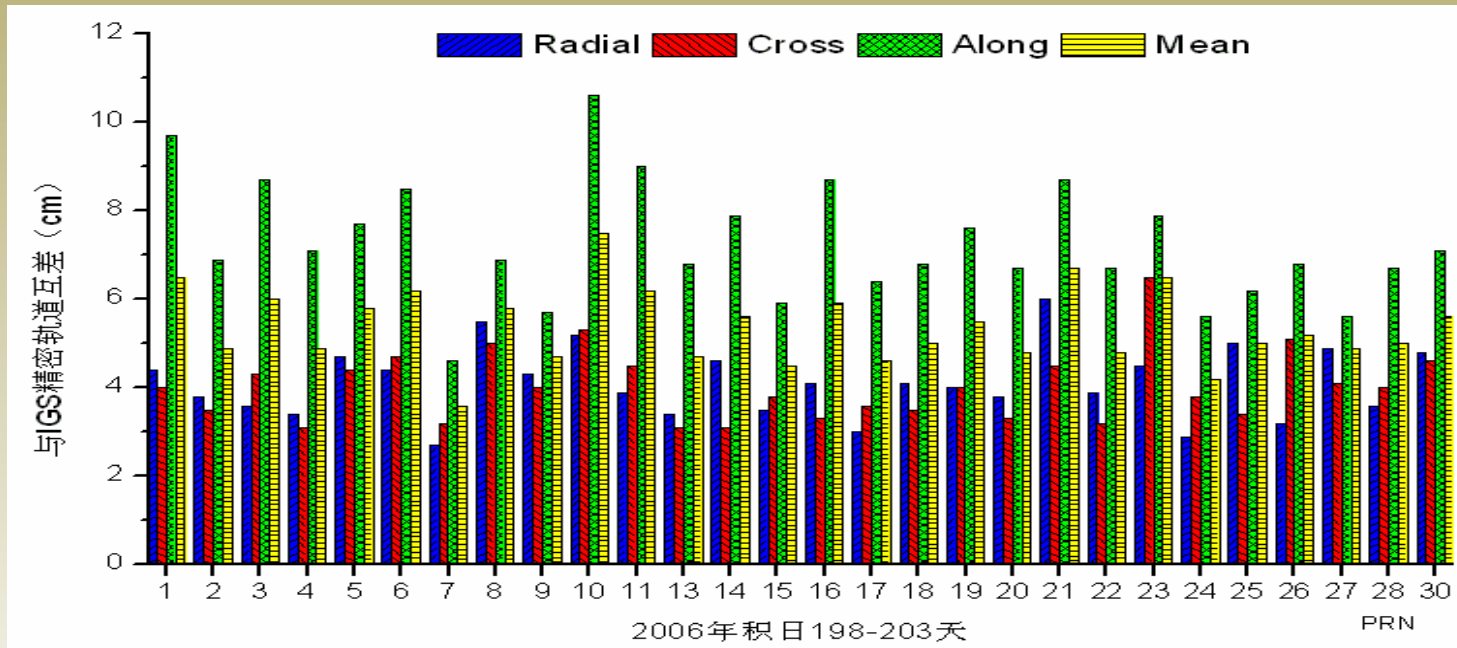


**Difference between calculated real-time orbits
and IGS final products**





Result of RT-POD (Hourly predicted) vs IGS Finals

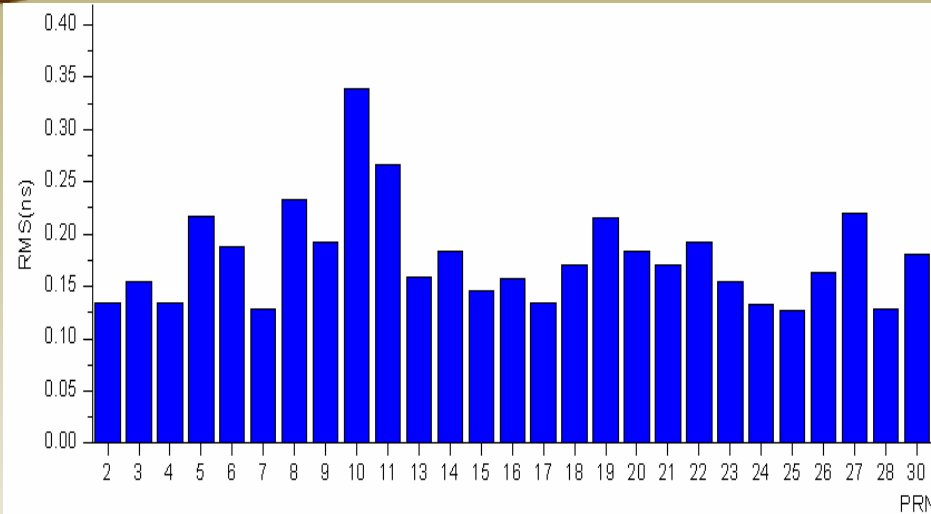


	Max (cm)	Min (cm)	Mean (cm)
Radial	6.0	2.7	4.1
Cross	6.5	3.1	4.0
Along	10.6	4.6	7.3
Mean	7.5	3.6	5.4





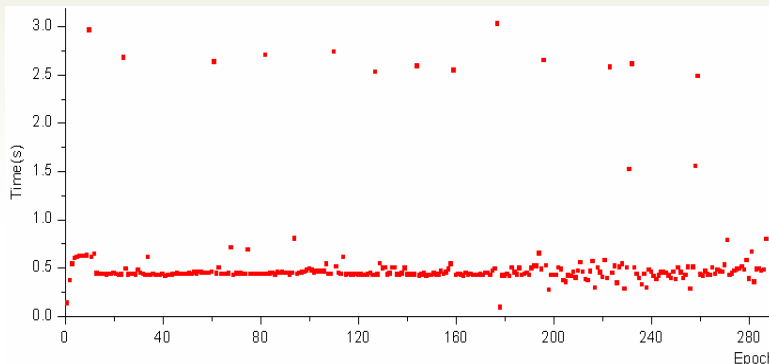
Result of RT-CLK vs IGS Finals



DOY	max(ns)	min(ns)	mean(ns)
198	0.30	0.04	0.13
199	0.36	0.10	0.22
200	0.38	0.07	0.16
201	0.31	0.07	0.18
202	0.30	0.12	0.19
203	0.41	0.07	0.21
mean			0.18

RMS values of the difference between the calculated Sat-Clock and IGS final products over the period day 198-203 of year 2006

Statistics of the RMS values
Mean RMS = 0.18 nanosecond

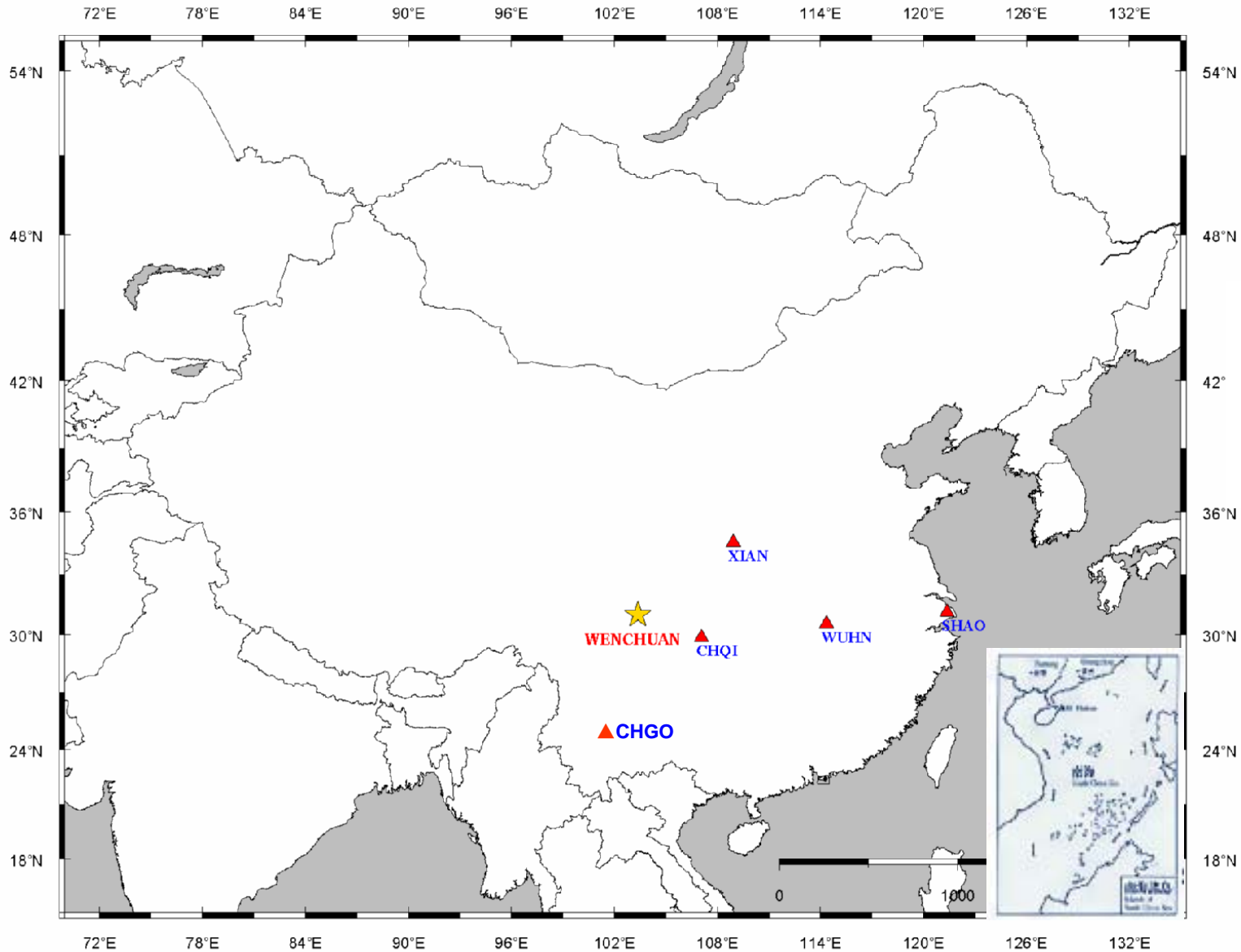


CPUT per epoch on IBM T60 notebook
Mean cup time =0.6s





Wen-chuan Mw 8.3 Earthquake: Deformation Analysis Using 1-Hz GPS Data

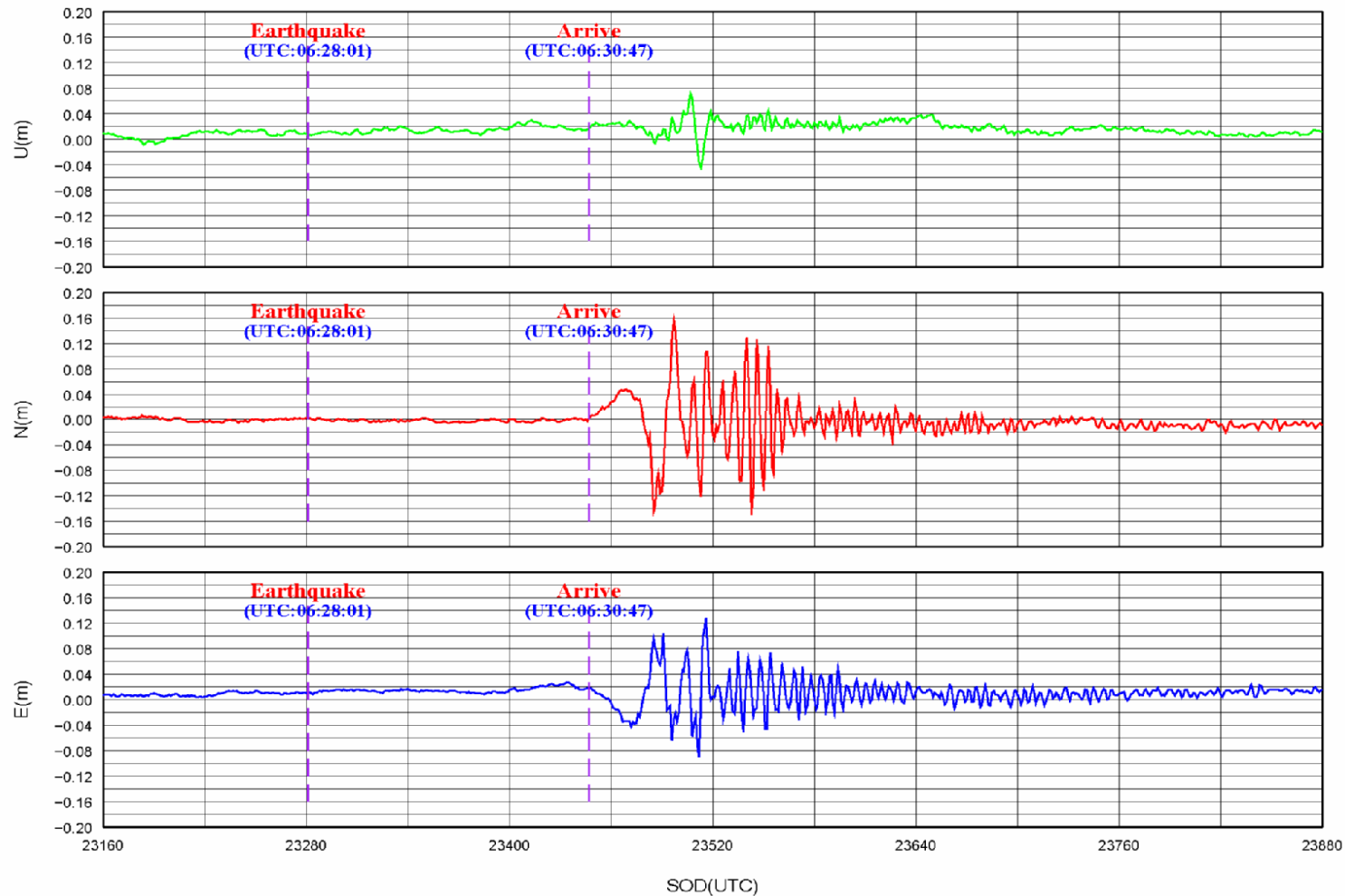


BISH 313.35km
XANY 649.14km
CHGO 679.47km
HUPI 1049.26km
SHQP 1665.97km





Xian station Displacement during Earthquake (with in 12 min.)



RMS

N: 0.97cm

E: 0.91cm

U: 2.79cm

Arrive

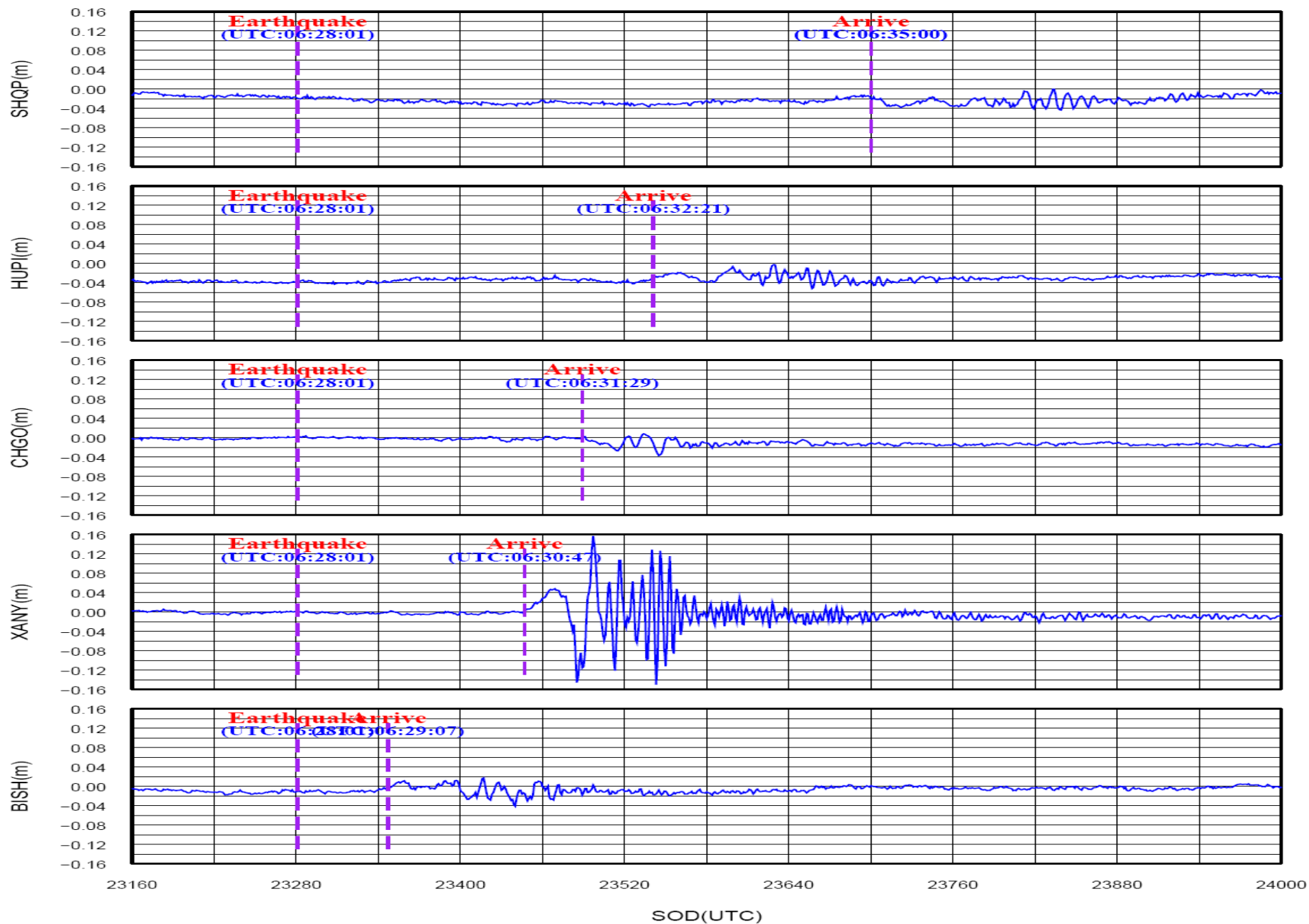
T-T0=166 s

$\Delta t=120s$

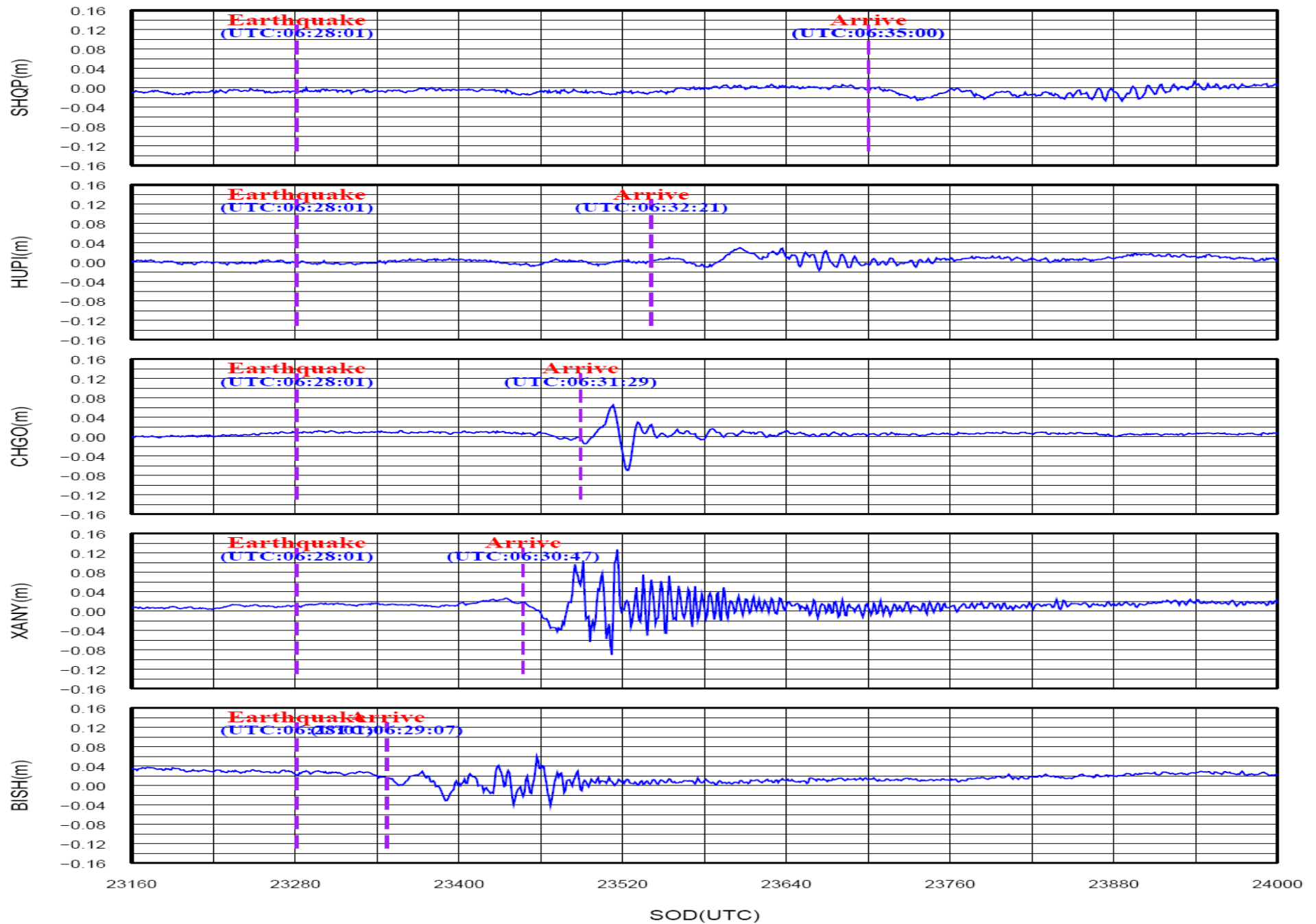
$v=3.89km/s$



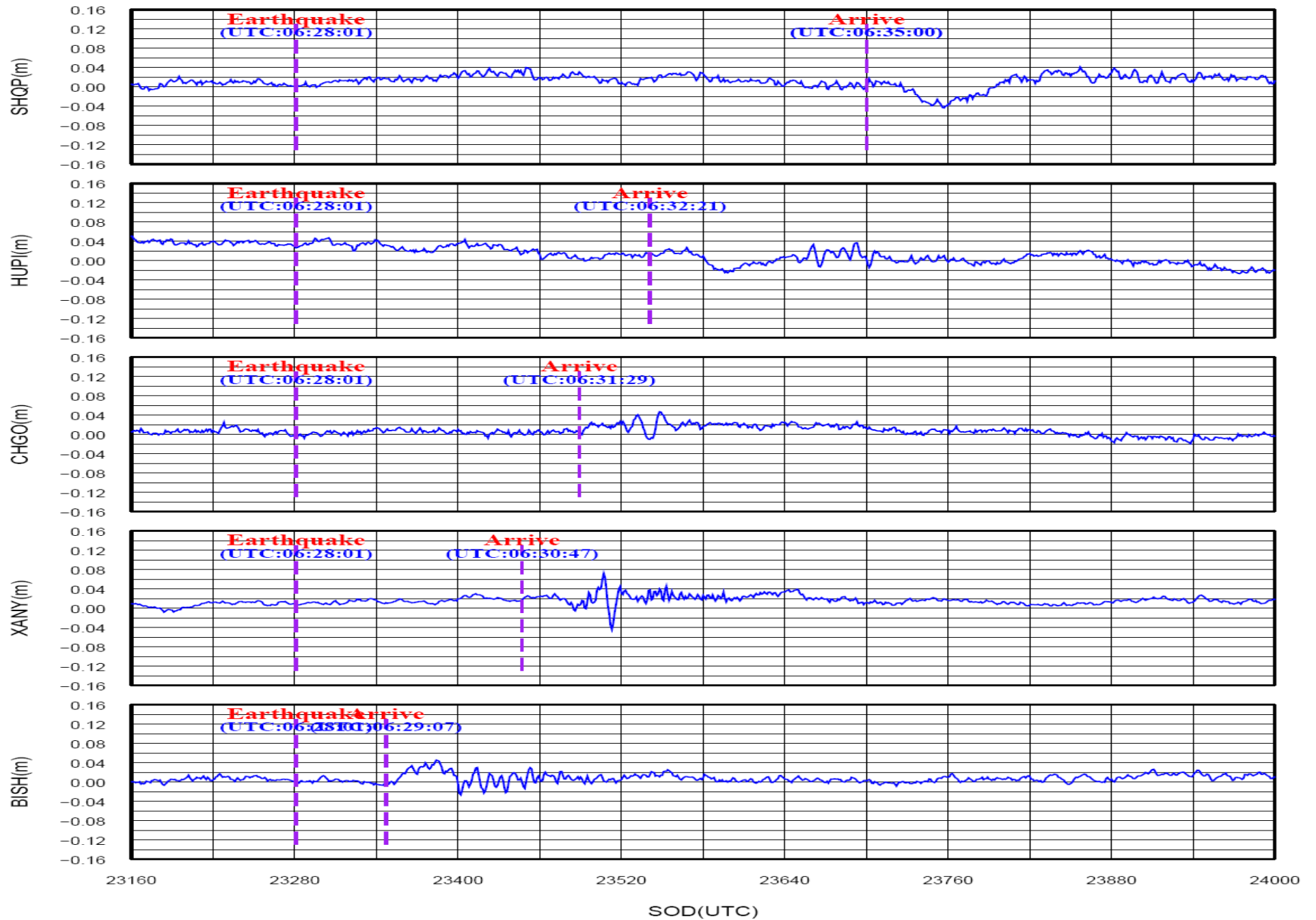
Displacement in N direction at CHINA around the 5.12 earthquake



Displacement in E direction at CHINA around the 5.12 earthquake

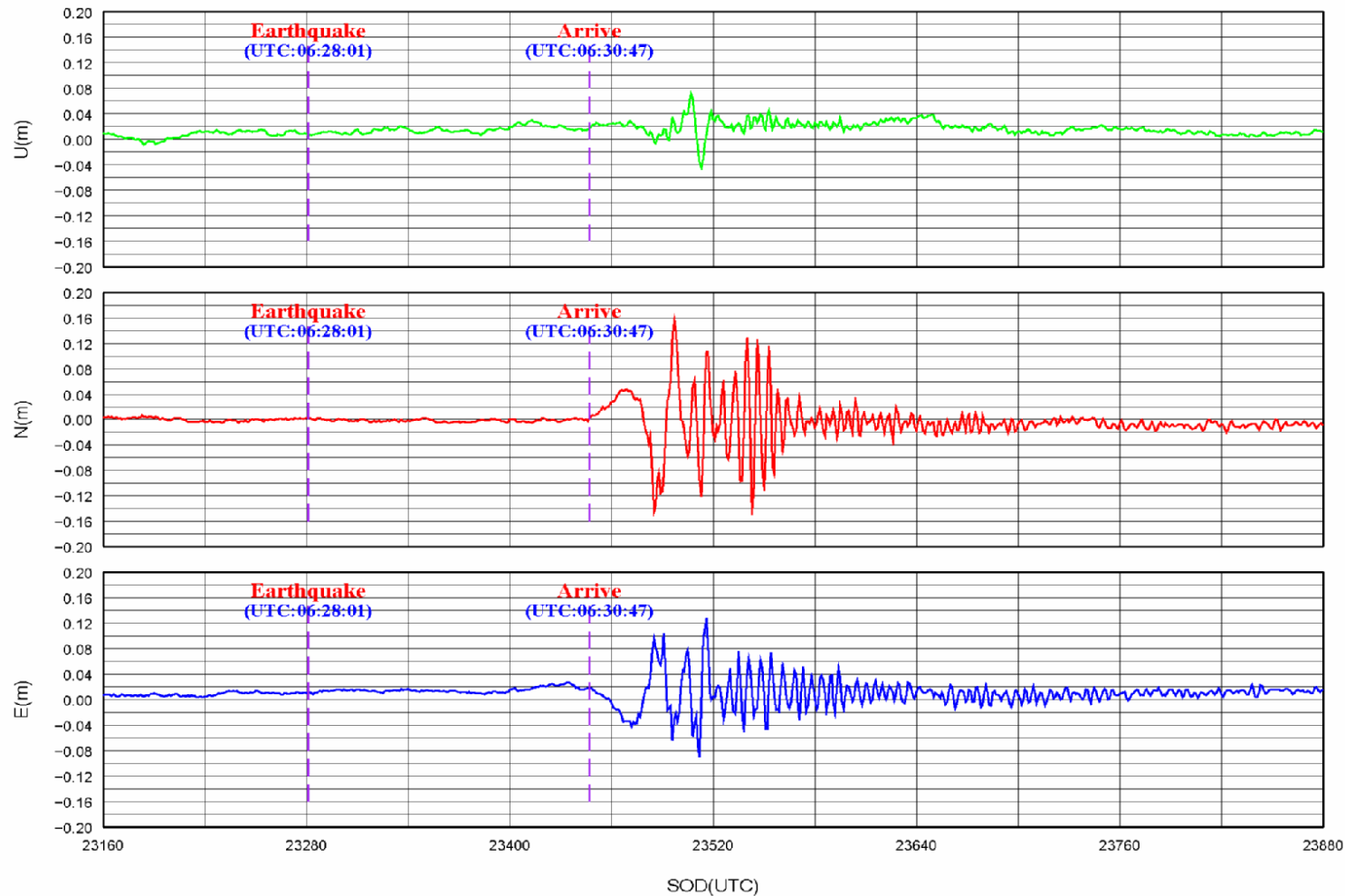


Displacement in U direction at CHINA around the 5.12 earthquake





Xian Displacement during Earthquake (12 Min.)



地震发生前后12分钟的点位变化





Thank You For Your Attention !

Shi@whu.edu.cn

