

NATIONAL GEODETIC SURVEY

NOAA-NGS CORS Network Guidelines for New and Existing Sites and their Relation to IGS

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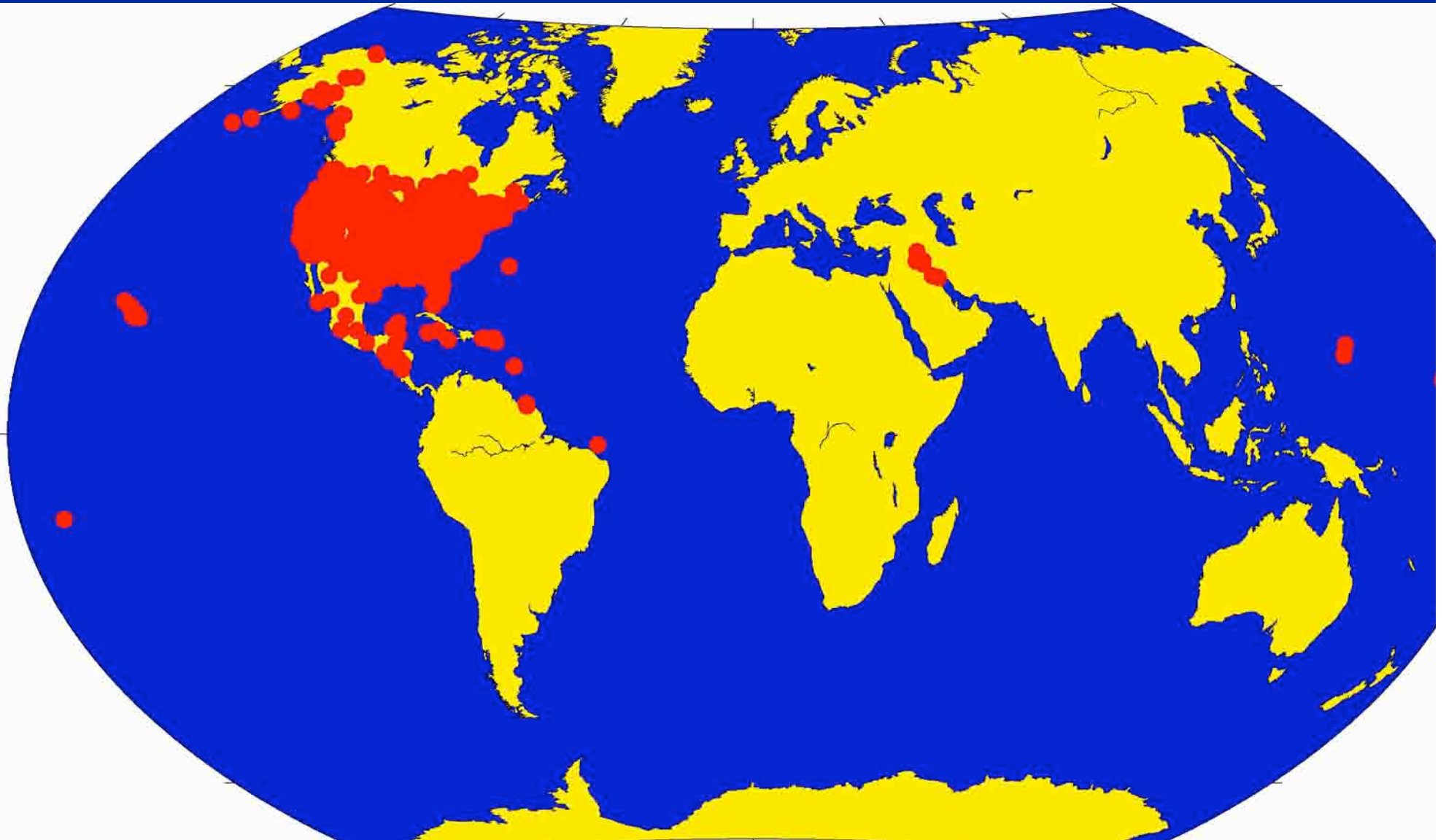
Goal

Upgrade the quality of CORS data and accuracy of associated meta data

Why Now?

- The network is mature more than 1 site every 100km
- Driven by VRS networks and success of OPUS (Online Positioning User Service)
- Quality versus quantity. Users want improved accuracy
- L2C is here, Galileo on its way and L5 is coming

**CIGNET (Cooperative International GPS Network)
To CORS (Continuous Operating Reference Stations
from ~10 (early 90's) to ~ 900 stations (April 2006)**



Concern

CORS network is 98% volunteer i.e. non-NGS
180 different site operators!

- Changes must be consistent with the needs of **both** NGS and site operators
- Guidelines must accommodate a diverse group of site operators and data users
- Minimize efforts by NGS for implementing guidelines and maximize user access to an accurate National Spatial Reference Frame (NSRF)

Guidelines

www.ngs.noaa.gov/CORS/Establish_Operate_CORS.html

Provide a set of required and recommended actions for establishing and operating a CORS station

Focus is on building on knowledge of the IGS and CORS networks over the past 12+ years

Success is achieved by

Ensuring that the guidelines are practical

Explaining WHY we want things done in a particular way (less phone calls and e-mails!)

First Draft September 2005 Official December 2005

April 2006 >90% of submissions meet guidelines

Implementation

Ensure all sites treated equally

Site Selection Team - Assess all new CORS based on current guidelines and requests changes if needed. 3-4 people meet every 2 weeks

Data quality - Establish metrics

Existing sites - Clean up all internal site meta data

Manufacturers - Ensure they are familiar and agree with guidelines (give others the ability to do your work)

Guidelines - Stability

Environment

The space around the antenna should not change for the lifetime of the site (minimum 15 years). No vegetation growth, additional structures, etc.

Choose site location carefully

Monument (structure that attaches the antenna to the ground)

No perfect “monument” therefore none recommended

Pillar: top surface narrower than antenna

Sidewall mount: 3 bolts through the mast

Must have leveling and orienting device

Guidelines - Equipment

Antennas

- Radomes NOT recommended (No cone radomes)
 - WHY: distort signal and not required in design of antenna
- Oriented to true North
 - WHY: apply antenna phase center values correctly
- Reference mark to antenna reference point (ARP) constant
 - WHY: change antenna same coordinate

Receivers

- Cutoff angle 5° required, 0° preferred
 - WHY: important for vertical positioning
- Collect hourly files, not daily moving to real-time
 - WHY: OPUS and derivative products



Problem
lightning rod
obstructs
satellites
radome

Problem wooden support
U-bolts height can change



Problem tribrach "feet"
cannot be locked height can
be changed radome



Antennas on
towers with
guy wires
poor stability





Good top
surface of pillar
narrower than
antenna
problem no
orienting &
leveling device



Good orienting &
leveling devices



Good rooftop
with orienting &
leveling device



Guidelines - Meta-data

As important as the GPS data quality

Site Log - Written record of all equipment ever used and contact info for a site

NGS will soon (< 1 month) have a web based log file creator and checker

Check install and remove dates, antenna and radome type (reduce human error)

Photographs - Visual record of equipment and monument
We require 10-12 photographs

Required photographs
10 for Ground sites
12 for Roof sites

Additional e.g.
installation/older
photos also archived

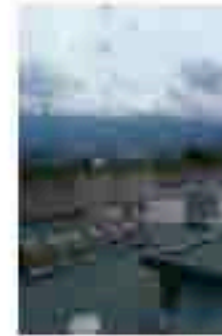


CORS Site Photos



San Jose, CR (CRCC)

[Description of photos](#) | [Additional Photos](#) | [Send Photos to Us](#)



looking north



looking west



overall antenna view



looking east



looking south



antenna mark



antenna monument



antenna serial #



receiver serial #



receiver



Log File Monument Info

Classification

Monument Description : (PILLAR/BRASS PLATE/STEEL MAST/etc)
 Height of the Monument : (m)
 Monument Foundation : (STEEL RODS, CONCRETE BLOCK, ROOF, etc)
 Foundation Depth : (m)
 Marker Description : (CHISELLED CROSS/DIVOT/BRASS NAIL/etc)
 Date Installed : 1996-04-09
 Geologic Characteristic : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
 Bedrock Type : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
 Bedrock Condition : (FRESH/JOINTED/WEATHERED)
 Fracture Spacing : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
 Fault zones nearby : (YES/NO/Name of the zone)
 Distance/activity : (multiple lines)
 Additional Information : DOMES number added
 MonuInfo roof tar sidewall mortar

Ground	Roof
Braced	Metal
Bi	In-parap
Tri	Middle
Mast	Chimn
Tall	Other
Short	Sidewal
Pillar	Morta
Narrow	Metal
Wide	Unknow
Unbraced	Mortar (tar)
Refusal	In-parap
Bedrock	Middle
Unknown	Chimn
	Other
	Sidewal
	Morta
	Metal
	Unknow

Add 1 line in Additional Info
 MonuInfo

Data Quality Check

Individual site quality assessment is based on a comparison to the network as a whole, not an arbitrary standard

The worst performing sites will be encouraged to upgrade and may be dropped from the CORS network

Make plots comprehensive and useful for NGS
AND (more importantly)

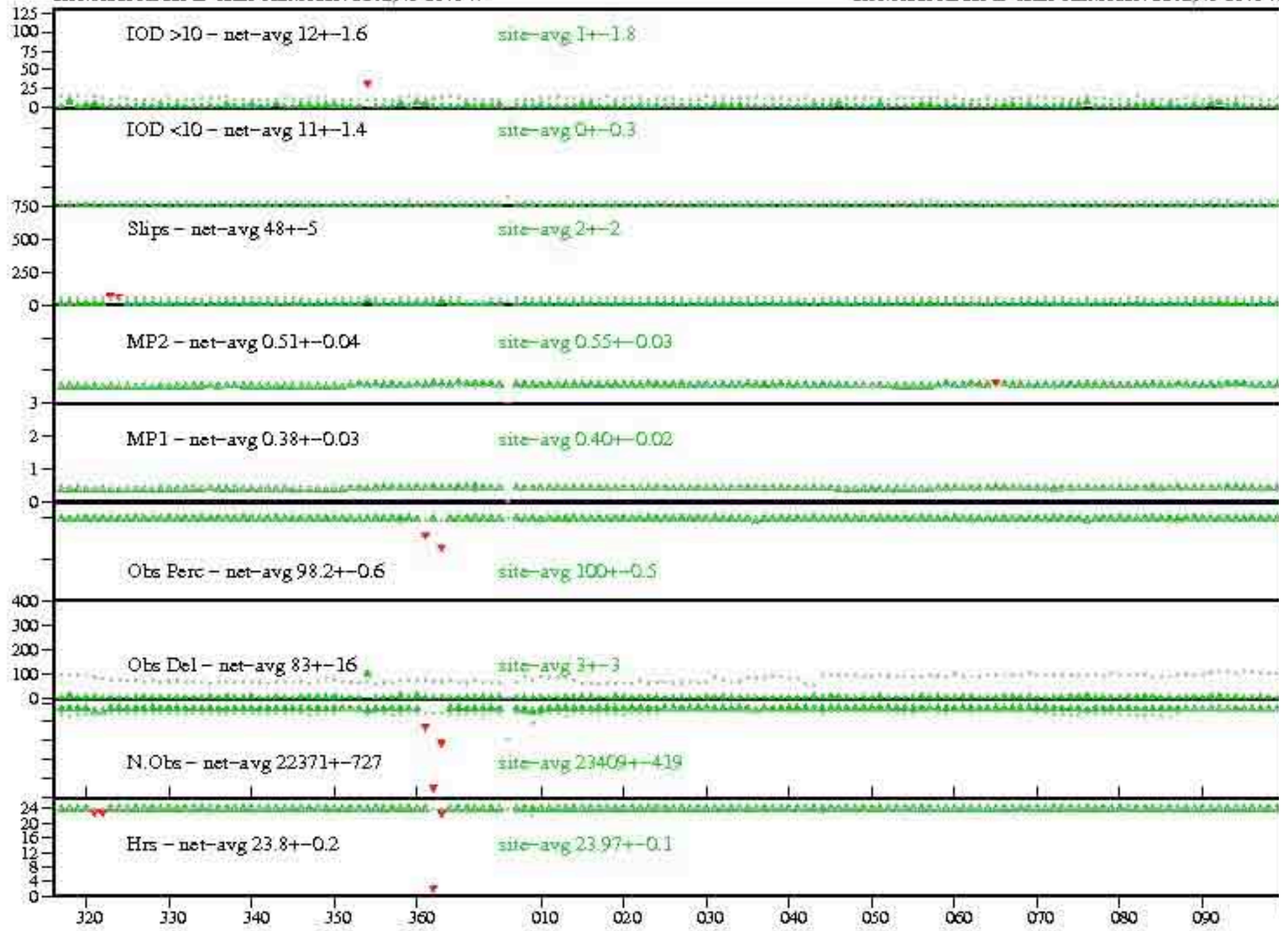
Make plots simple so site operators can understand and show “upper management” if they need to upgrade/technical help

Use TEQC from UNAVCO

- CHO1 - 2005-316 to 2006-100

Rec: ASHTECH Z-XII3 Ant: ASH700829.3 SNOW

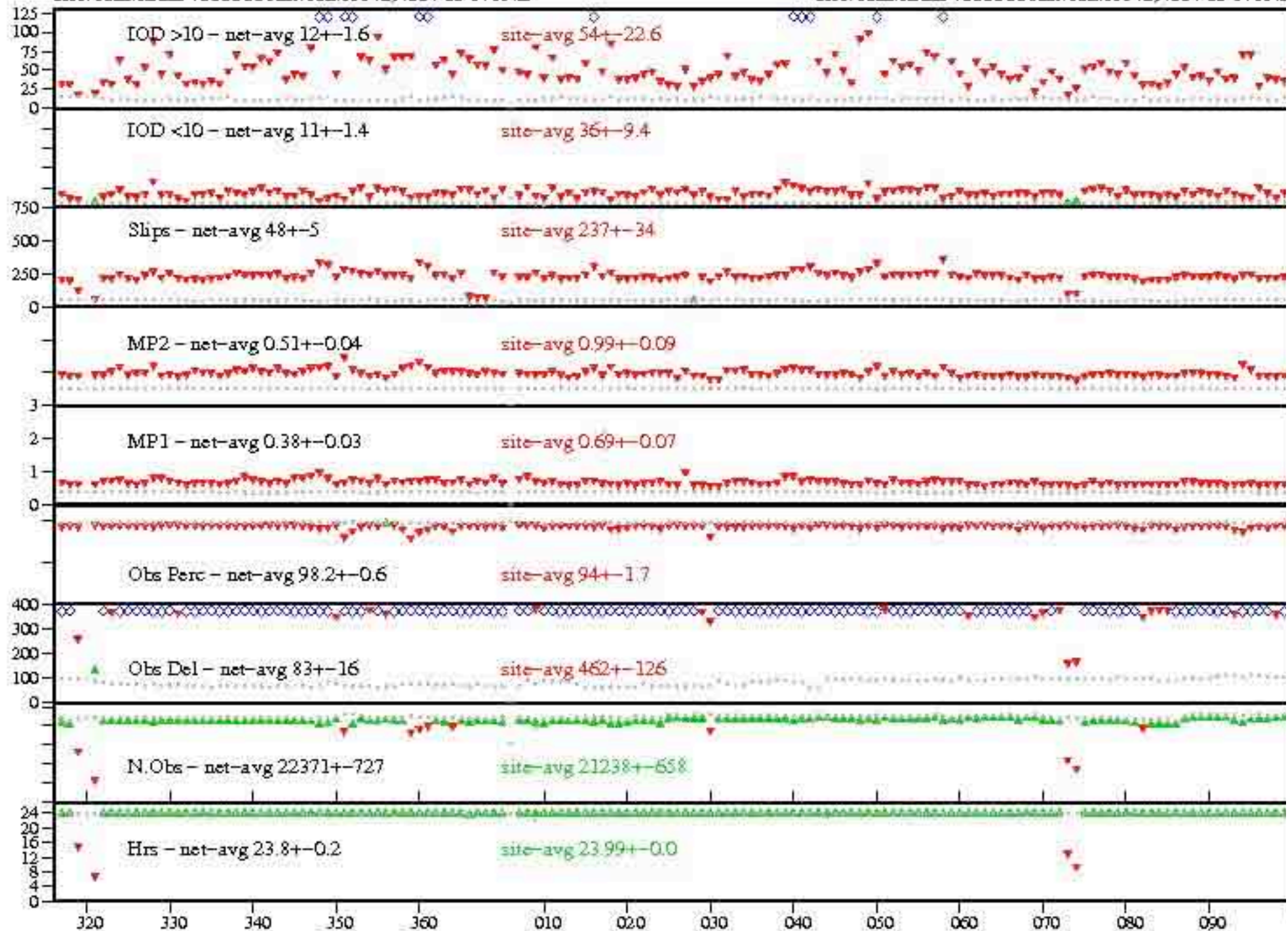
Rec: ASHTECH Z-XII3 Ant: ASH700829.3 SNOW



- BARN - 2005-316 to 2006-100

Rec: TRIMBLE 4000SSI Ant: TRM33429.00+GP NONE

Rec: TRIMBLE 4000SSI Ant: TRM33429.00+GP NONE

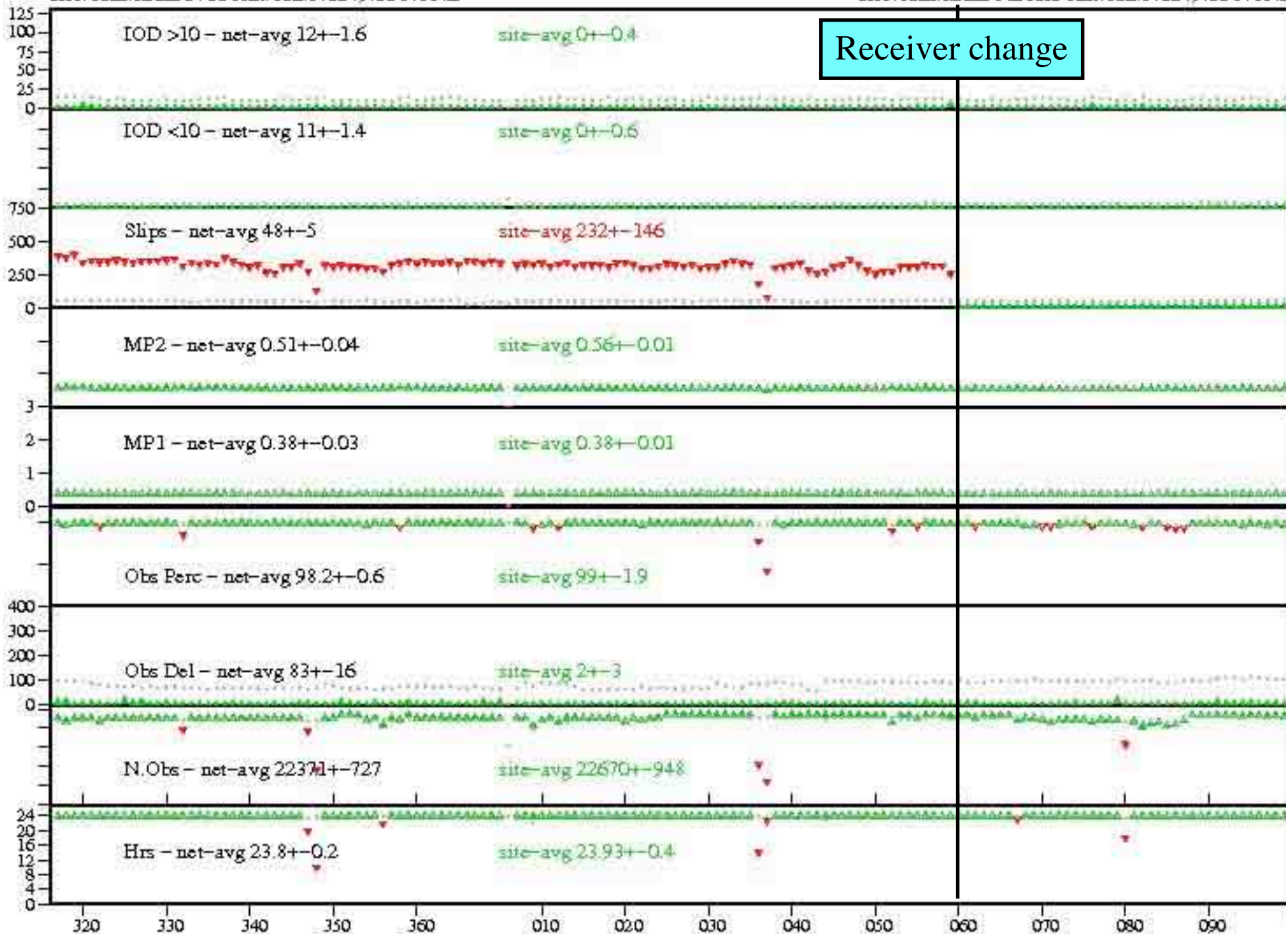


-TXYT - 2005-316 to 2006-100

Rec: TRIMBLE S700 Ant: TRM41249.00 NONE

Rec: TRIMBLE NETRS Ant: TRM41249.00 NONE

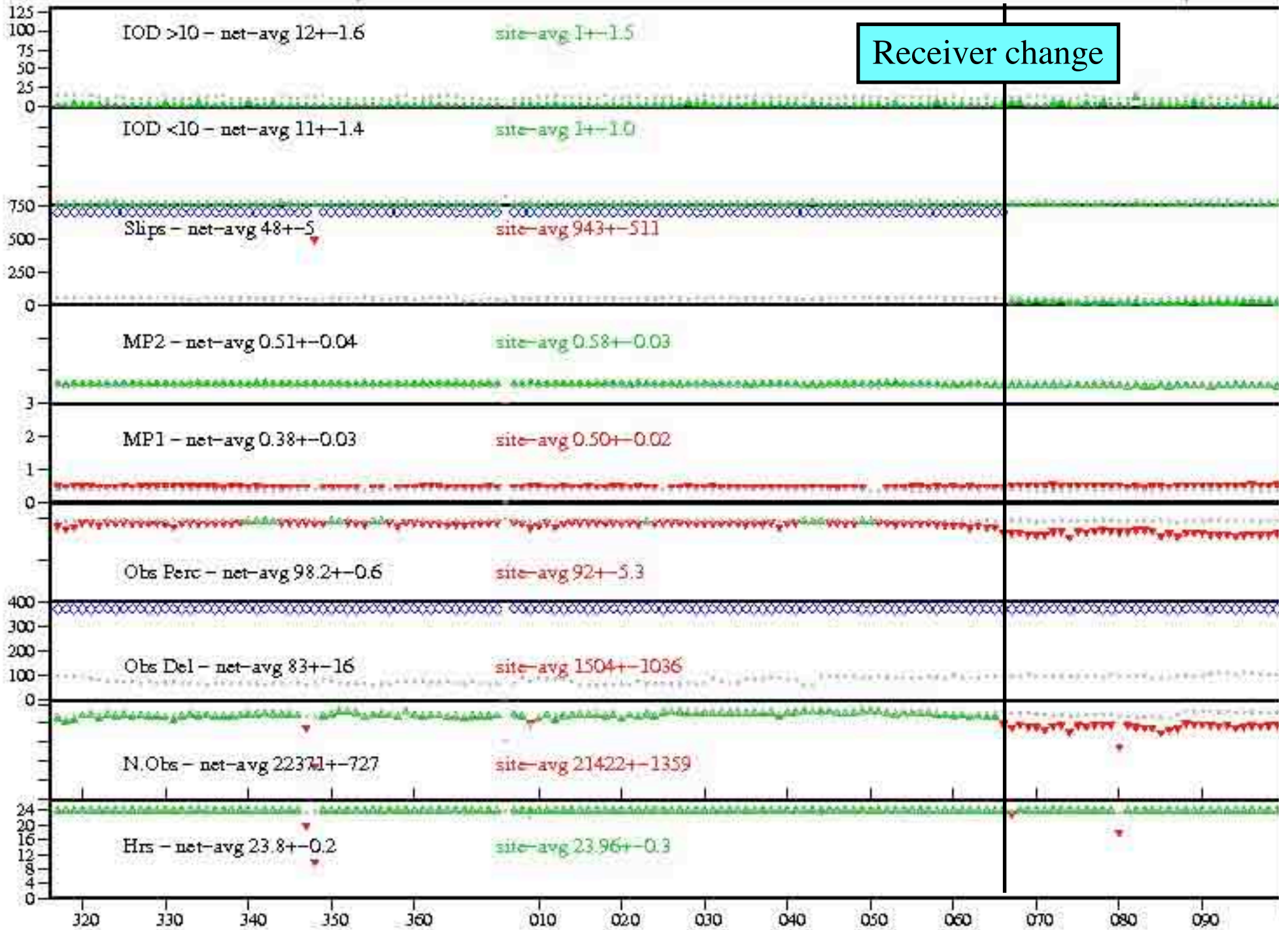
Receiver change



- TXAN - 2005-316 to 2006-100

Rec: TRIMBLE S700 Ant: TRM41249.00 NONE

Rec: TRIMBLE NETRS Ant: TRM41249.00 NONE



Future CORS

Certain

1 St. Croix
1 St. Thomas
1 British Virgin Is.
1 Puerto Rico
3-4 Ethiopia

Possible

Dominican Republic
Afghanistan
Benin

