



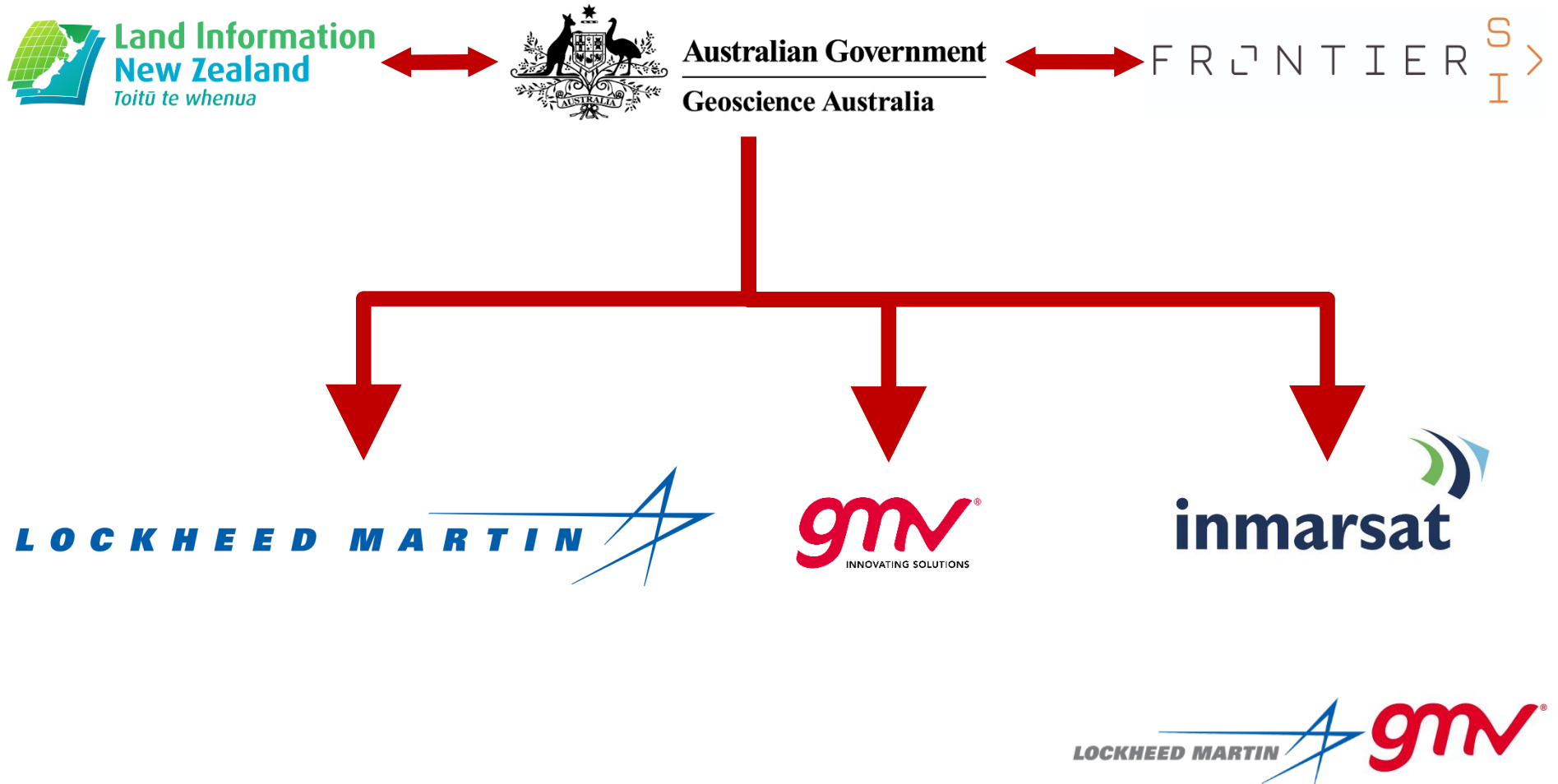
# Results on Australia and New Zealand Second Generation SBAS and PPP Augmentation System

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*jbarrios@gmv.com*

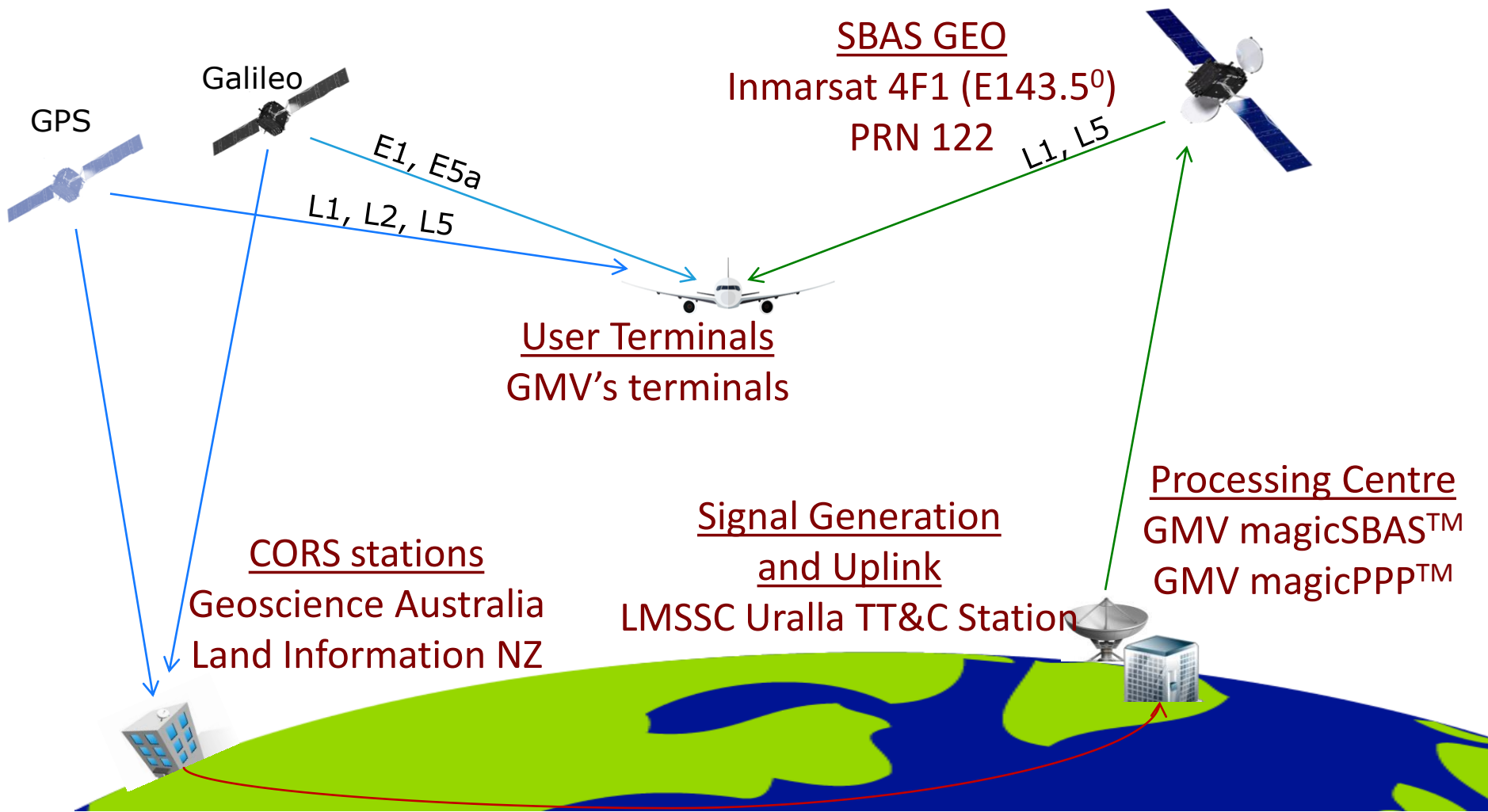
*Authors: Julián Barrios<sup>(1)</sup>, Jose Caro<sup>(1)</sup>, Guillermo Fernández<sup>(1)</sup>, Jose Gabriel Pericacho<sup>(1)</sup>, Victor Manuel Esteban<sup>(1)</sup>, Miguel Angel Fernández<sup>(1)</sup>, Fernando Bravo<sup>(1)</sup>, Alessandra Calabrese<sup>(1)</sup>, Armais Diaz Chavez<sup>(1)</sup>, Jesus David Calle<sup>(1)</sup>, Enrique Carbonell<sup>(1)</sup>, Miguel M. Romay<sup>(1)</sup>, Irma Rodriguez<sup>(1)</sup>, Maria Dolores Laínez<sup>(1)</sup>, Robert, Jackson<sup>(2)</sup>, Patrick E. Reddan<sup>(3)</sup>, Deane Bunce<sup>(3)</sup>, Claudio Soddu<sup>(4)</sup>  
<sup>(1)</sup>GMV, <sup>(2)</sup>LM, <sup>(3)</sup>Zeta Associates, <sup>(4)</sup>Inmarsat*

# SYSTEM DESCRIPTION

# Australia and NZ SBAS Testbed

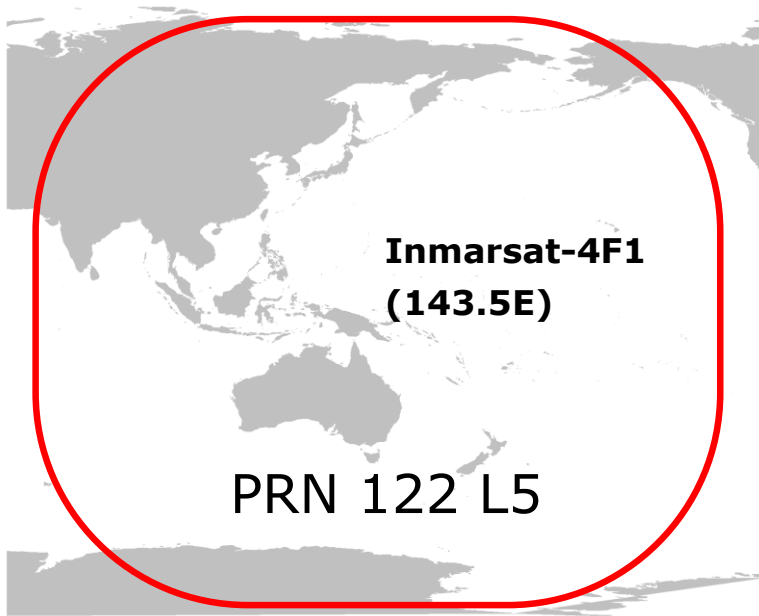


# Aus & NZ SBAS Testbed System Overview

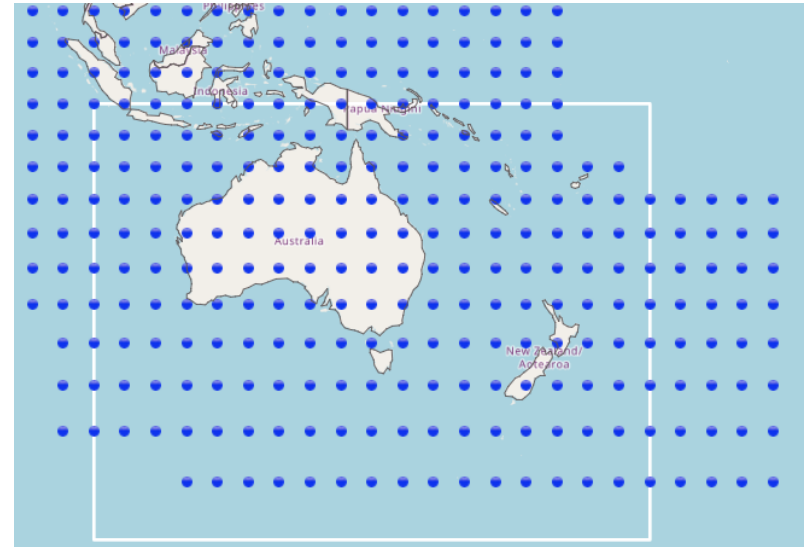


# Services Broadcasted

**SBAS DFMC & PPP**  
**GPS L1/L2 + Gal E1/E5a**



**SBAS L1 & PPP**  
**GPS L1/L2**



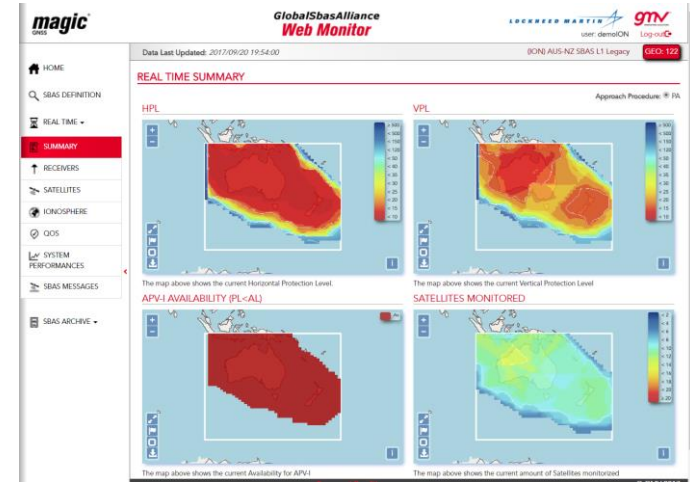
# Technology Map (Data Processing)



**magicSBAS**

**magicODTS**

**Orbit and Clock Estimation  
Ionospheric Estimation  
Integrity (GIVE, UDRE, DFRE)  
SBAS and PPP message**

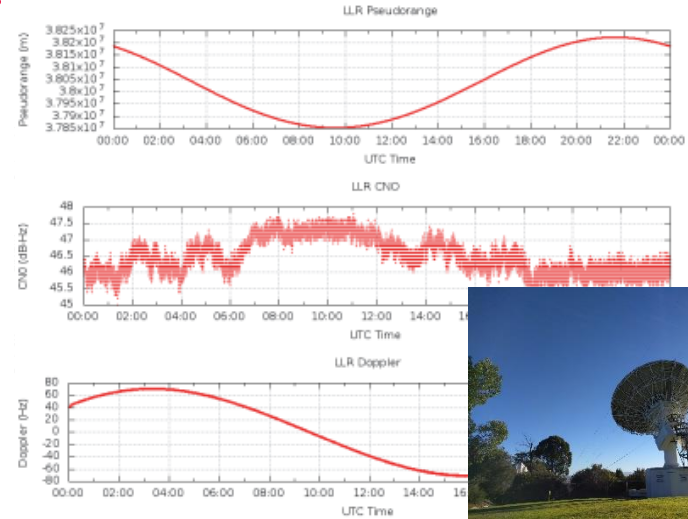


**System Operation  
RT System Monitoring  
Performance Analysis**

# TECHNOLOGY MAP (Uplink System)

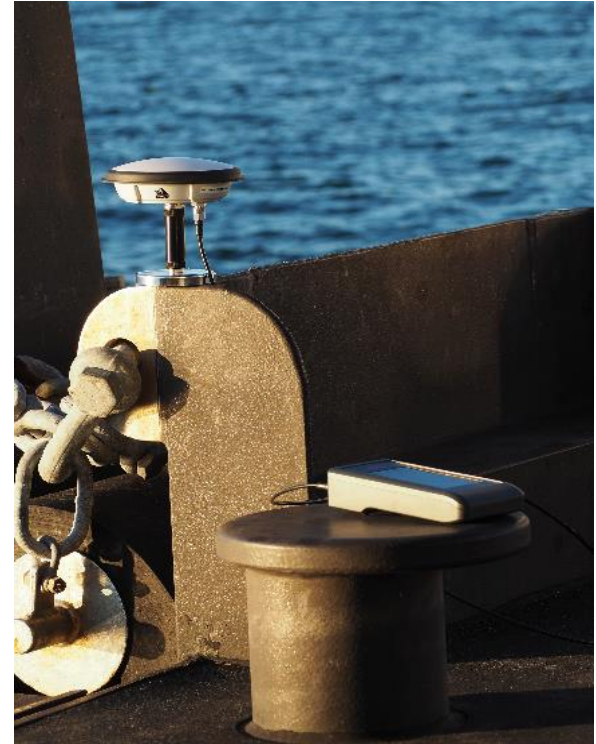


**Uplink Safety Monitor  
INTEROPERABILITY  
WITH OTHER SBAS IN THE  
REGION**



**SIGNAL Generation  
Signal Control and Sync  
GEO Uplink**

# USER SEGMENT SBAS L1, DFMC, PPP





# SBAS SYSTEM PERFORMANCES

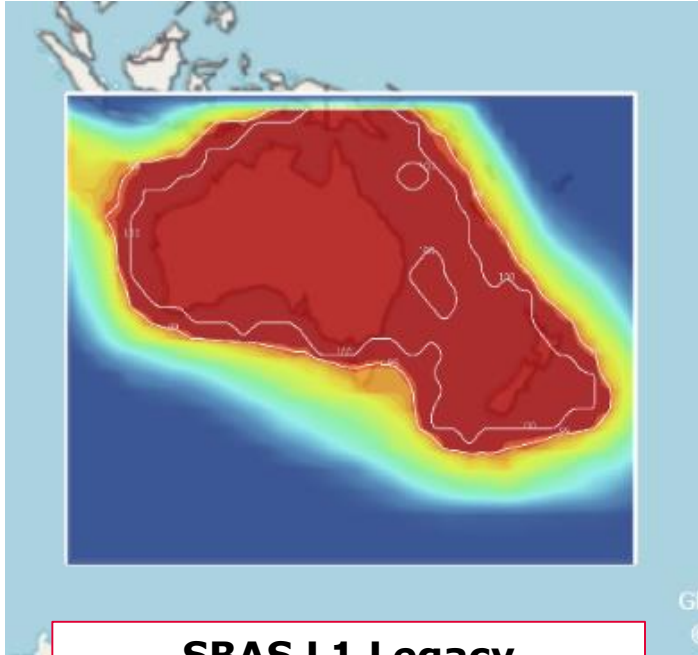
# System Availability

**SBAS L1 (LEGACY)**

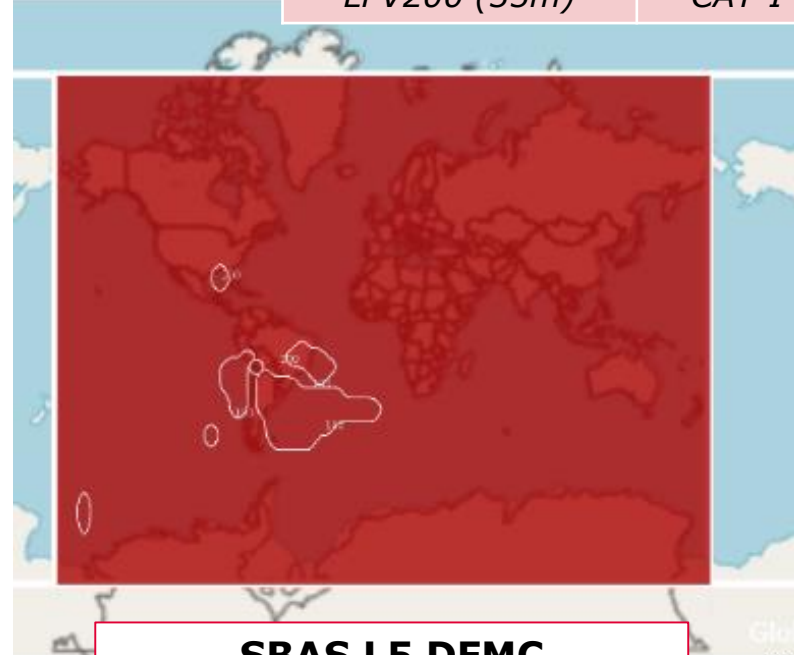
**SBAS L5 (DFMC)**

APV-I (50m)  
LPV200 (35m)

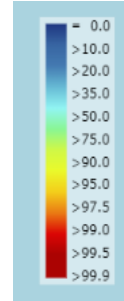
LPV200 (35m)  
CAT-I (15m)(\*)



**SBAS L1 Legacy  
06/06/2018 APV-I  
Availability Map**



**SBAS L5 DFMC  
06/06/2018 LPV-200  
Availability Map**

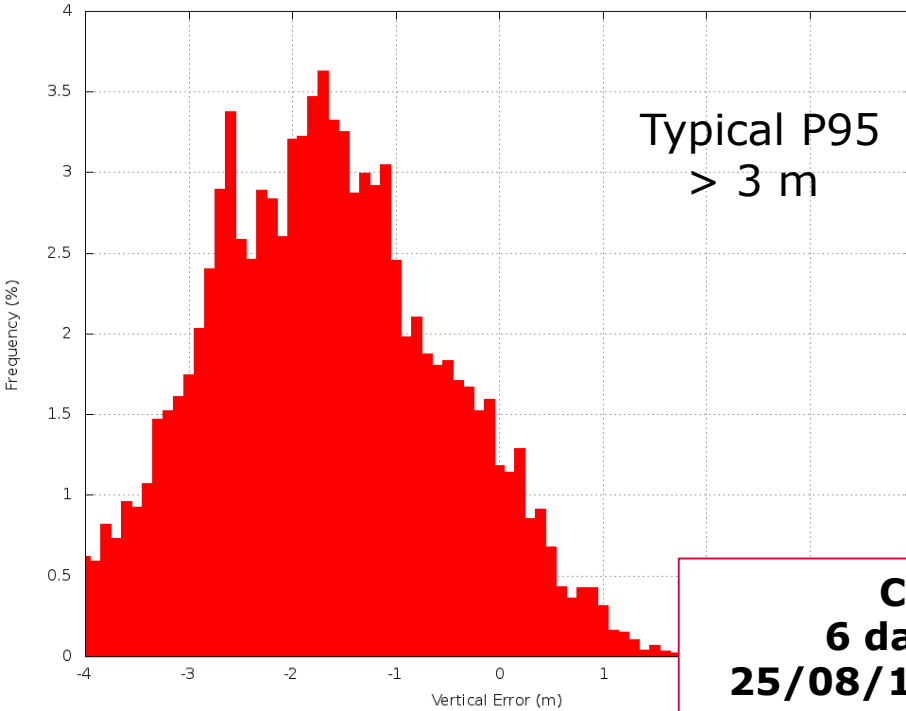


(\*) 10 meters Upon complete GPS+GAL constellations

# Vertical error GPS Single Frequency

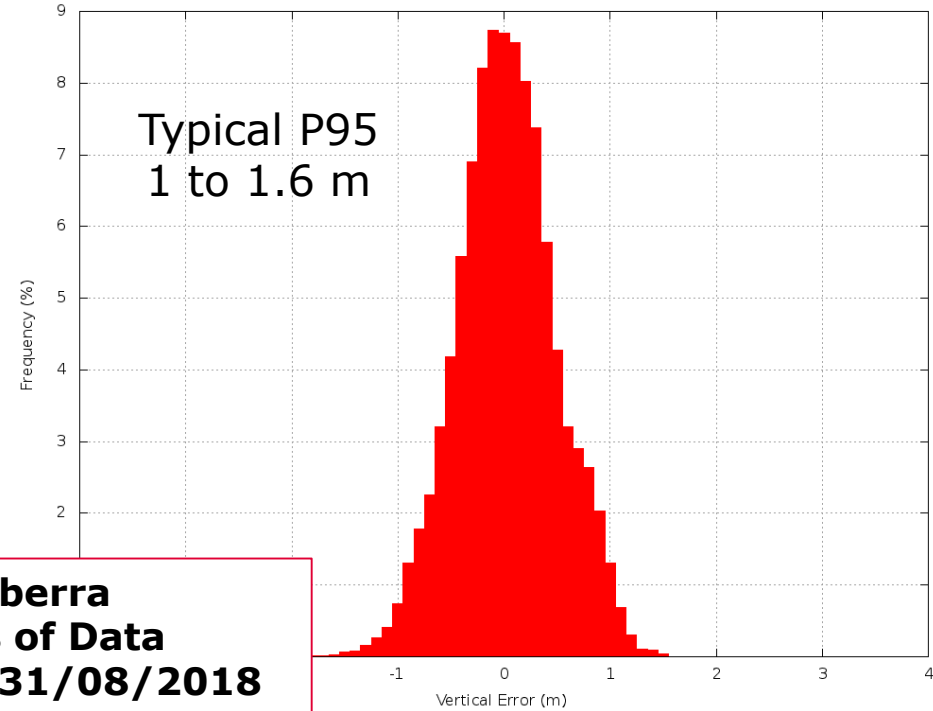
## GPS L1

Vertical Error (GPS)



## GPS L1 + Legacy SBAS

Vertical Error (GPS\_SBAS)

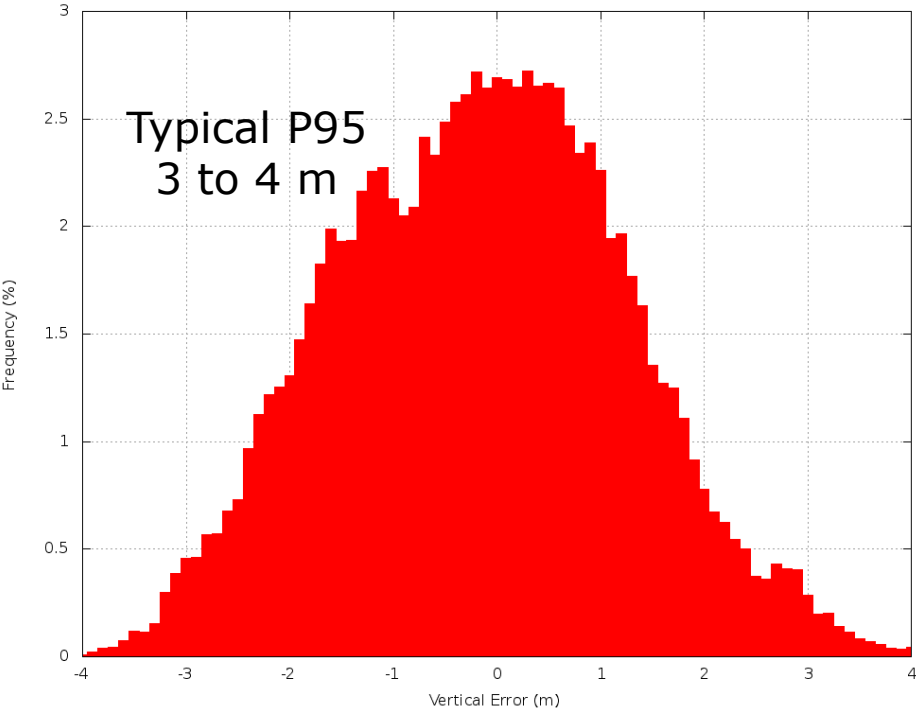


**Canberra**  
**6 days of Data**  
**25/08/18-31/08/2018**

# Vertical error GPS Dual Frequency

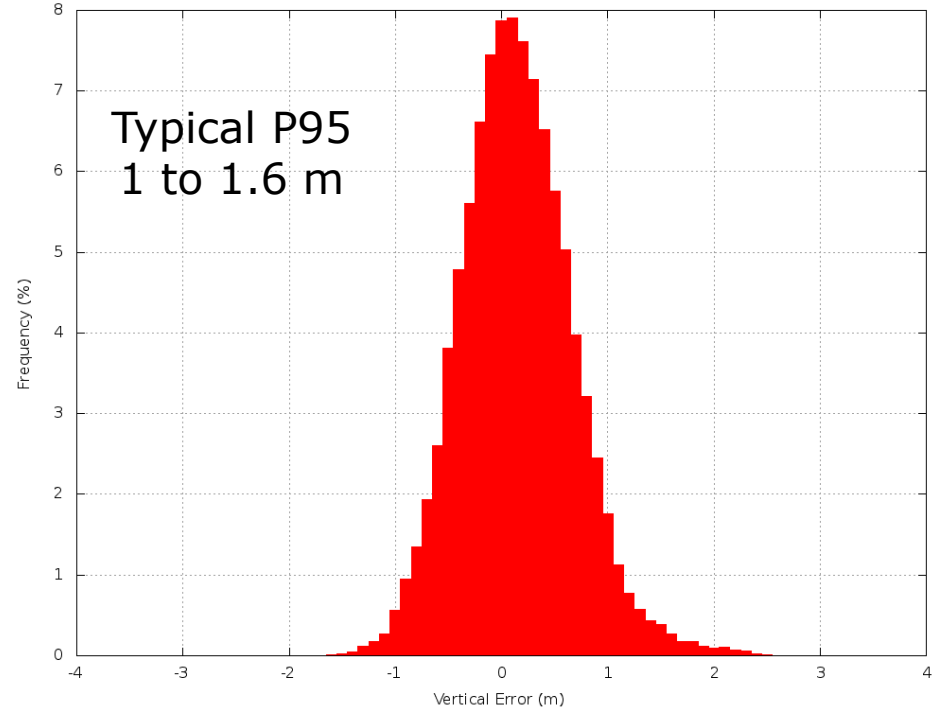
## GPS L1/L2

Vertical Error (GPS)



## GPS L1/L2 + DFMC SBAS

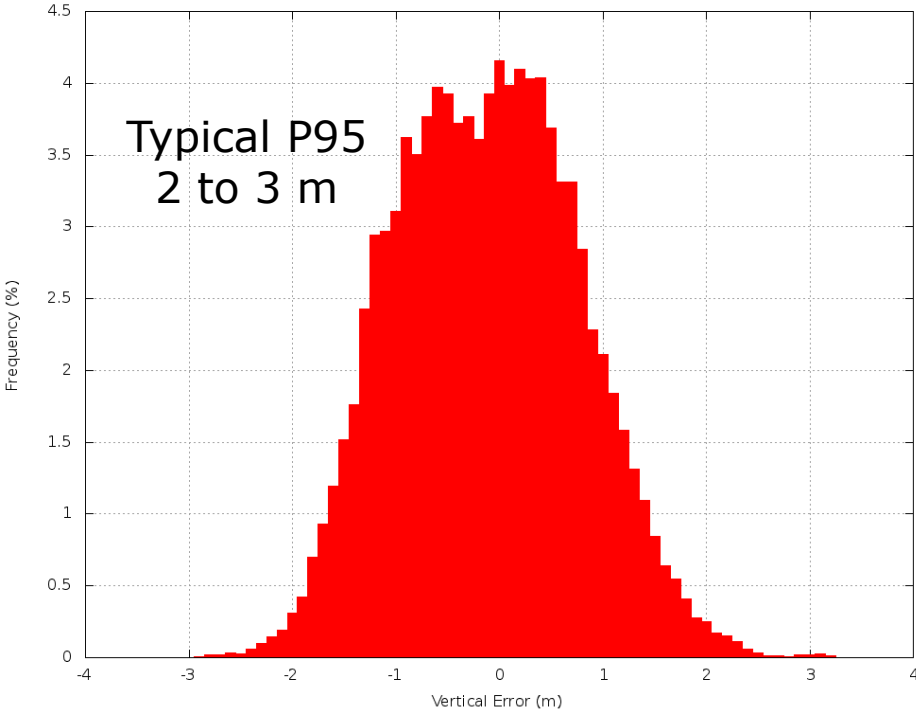
Vertical Error (GPS\_SBAS)



# Vertical error GPS+GAL Dual Frequency

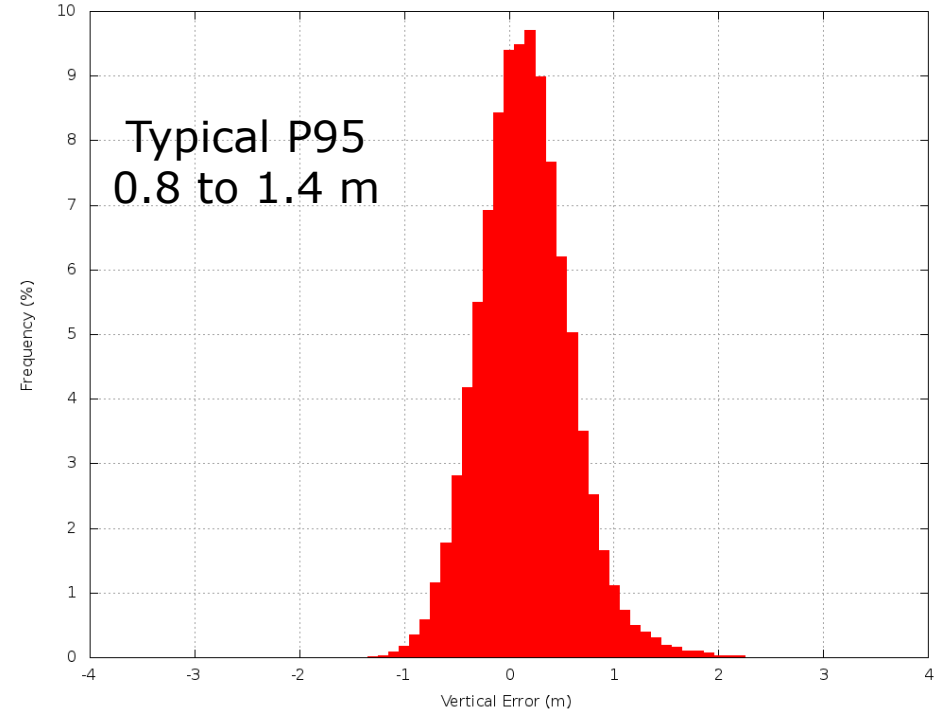
## GPS L1/L2 + Galileo E1/E5a

Vertical Error (GPS\_GAL)



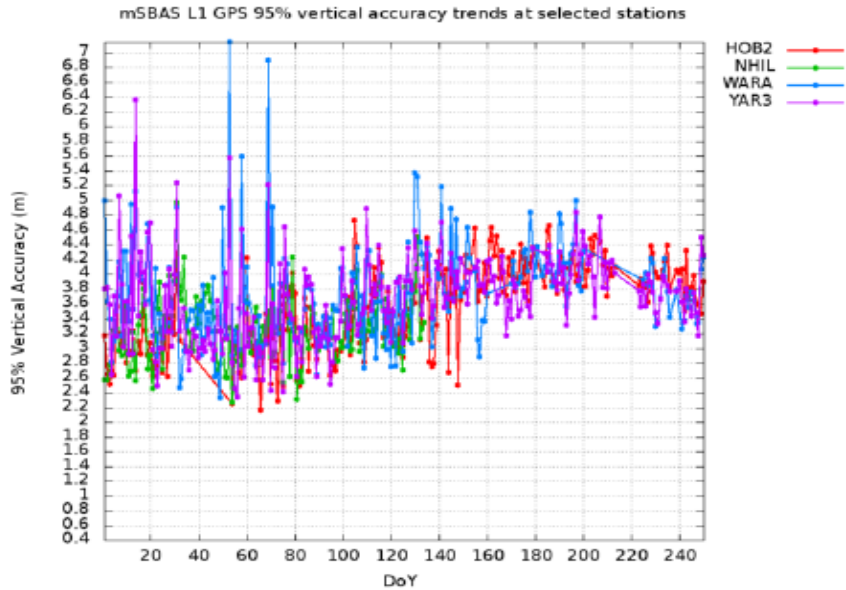
## GPS + Galileo + DFMC SBAS

Vertical Error (GPS\_GAL\_SBAS)

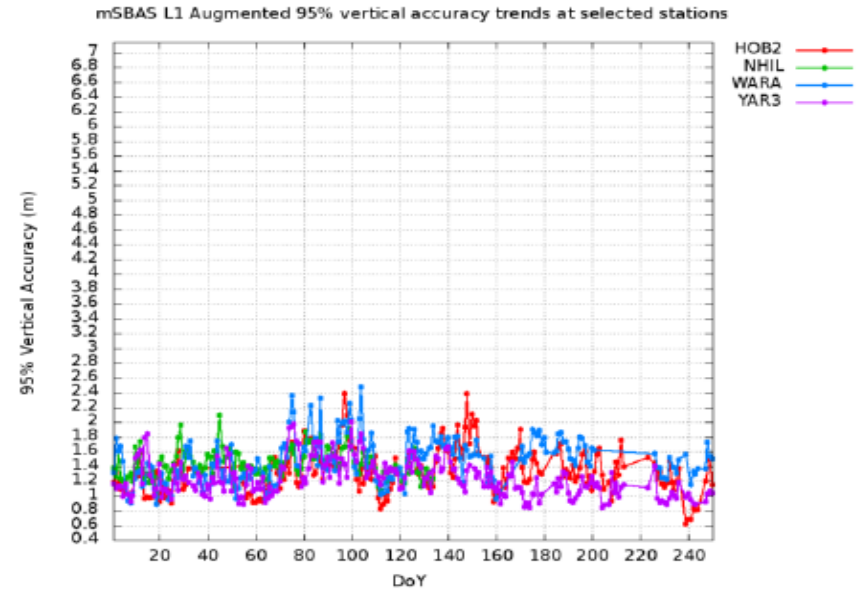


# Vertical error at 95% for GPS L1

## GPS L1

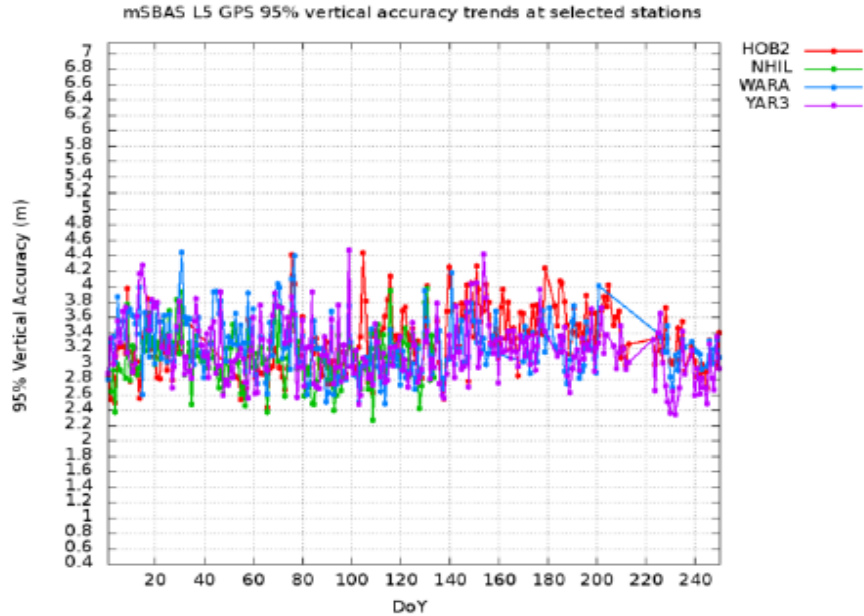


## GPS L1 + SBAS L1 Legacy

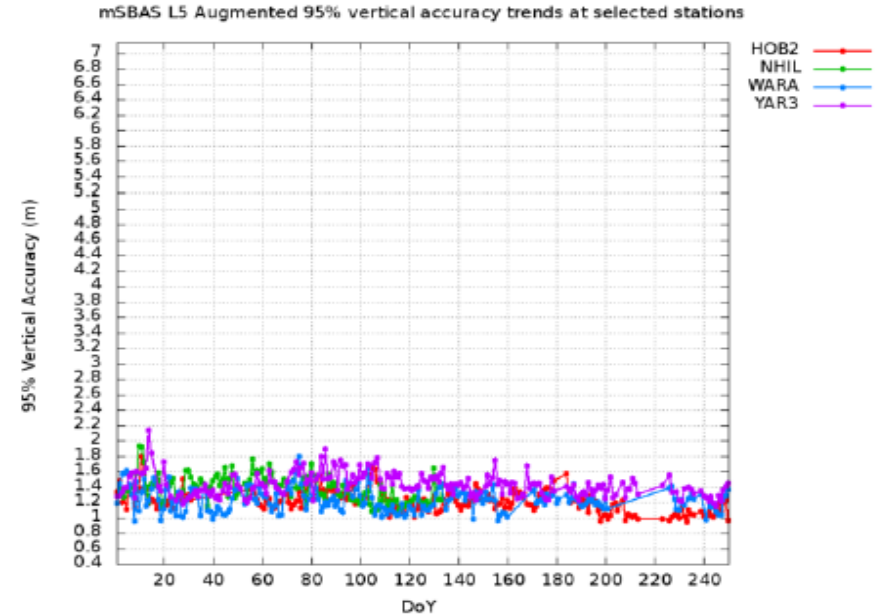


# Vertical error at 95% for GPS L1/L2

## GPS L1/L2



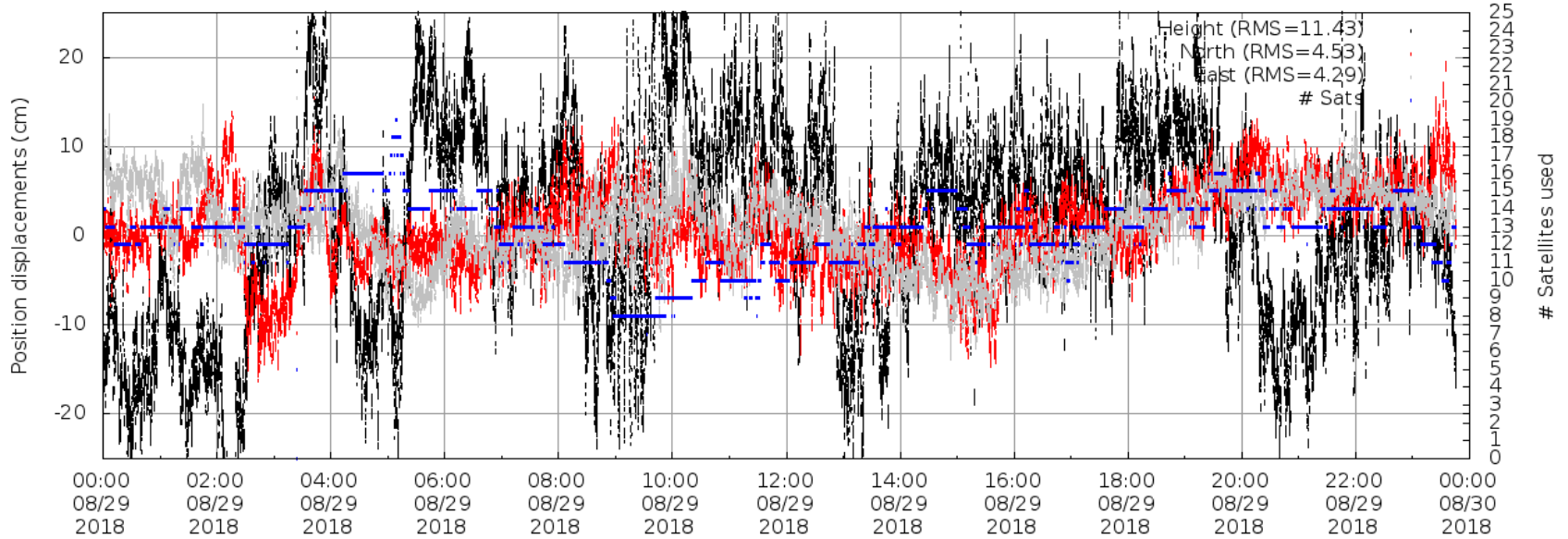
## GPS L1/L2 + SBAS DFMC



# PPP SYSTEM PERFORMANCES

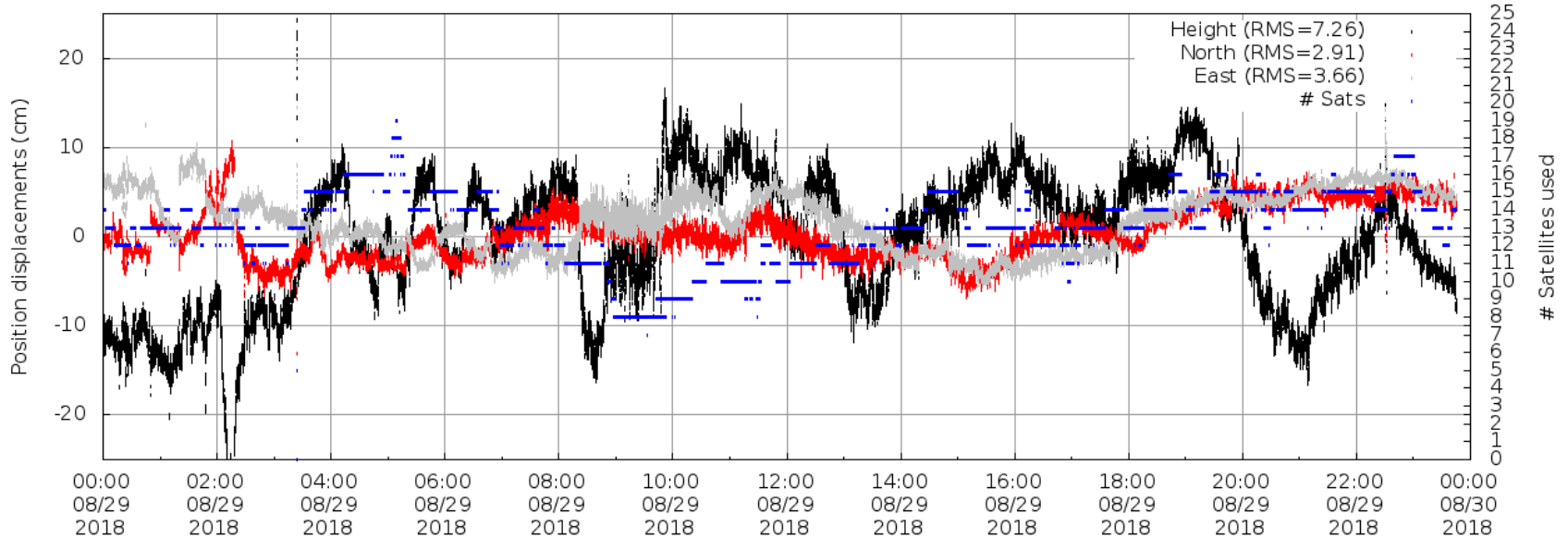


203\_SBAS\_PPP\_SISNET\_GE\_DFMC



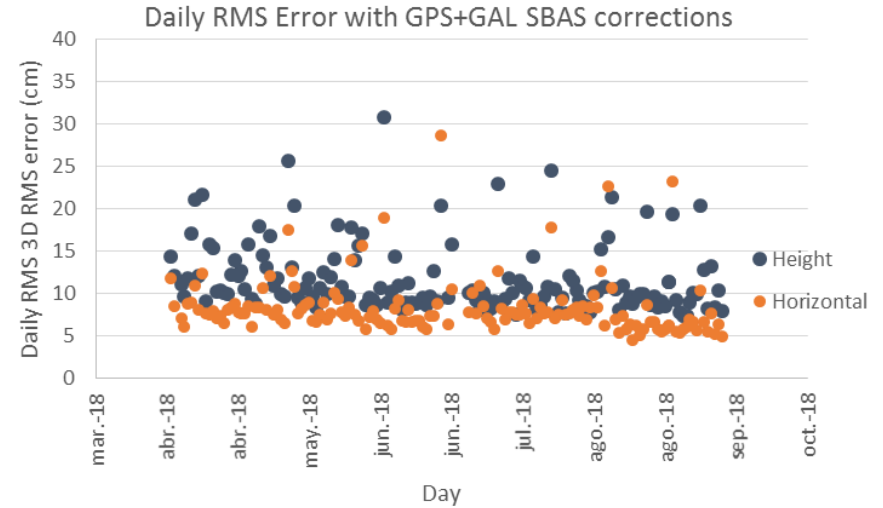
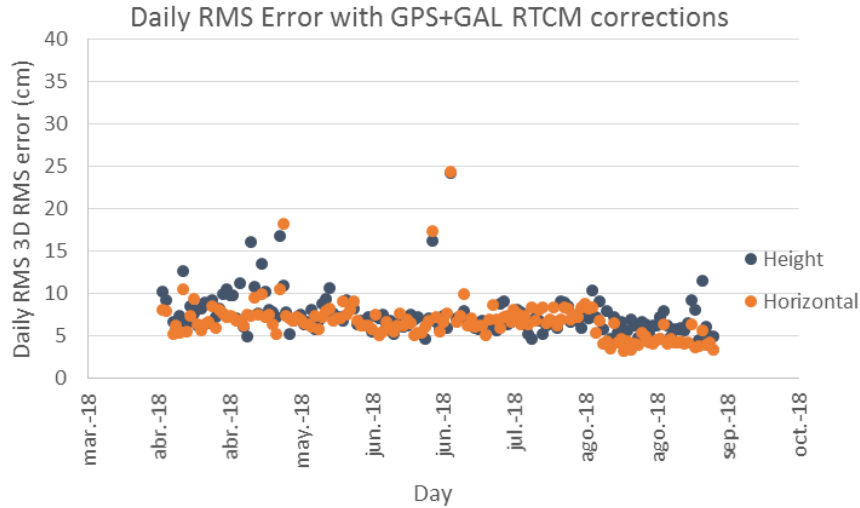
# GPS+GAL PPP THROUGH SBAS L5

201\_SBAS\_PPP\_GE\_RTCM



# GPS+GAL PPP THROUGH RTCM

# RT-PPP Daily Analysis



## RT-PPP Daily RMS average at PARK station for 5 months

	RTCM GPS	SBAS L1 GPS	RTCM GPS+GAL	SBAS L1 GPS+GAL
Horizontal	8.97 cm	10.17 cm	6.80 cm	8.35 cm
Vertical	10.67 cm	14.47 cm	7.54 cm	11.69 cm

**AUS+NZ SBAS TB**  
**All services up since**  
**Oct. 2017**  
**with excellent**  
**performance**



# THANK YOU

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