SERVICIO NACIONAL DE METEOROLOGIA E HIDROLOGIA
SENAMHI

PERU NMHS´S ACTIONS TO OVERCOME THE ROLLOVER EVENT

GOES Data Collection Service (DCS) Technical Working Group (TWG)
April 25th, 2023

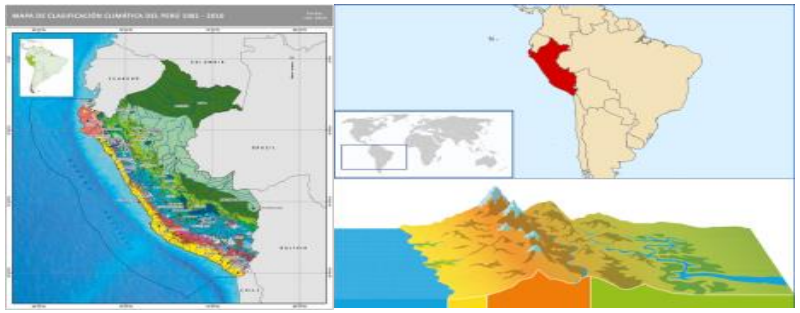
Ing. Jorge Chira La Rosa
jchira@senamhi.gob.pe

Outline

I. INTRODUCTION TO THE COUNTRY AND THE NMHS
II. SUMMARY OF NATIONAL OBSERVING CAPABILITIES
III. SENAMHI GOES DCS DCP
IV. GOES DCS DATA APPLICATIONS AND USERS
V. ROLLOVER EVENT
VI. SENAMHI ACTIONS TO OVERCOME ROLLOVER EVENT
VII. SUMMARY

INTRODUCTION TO THE COUNTRY AND THE NMHS

INTRODUCTION TO PERU



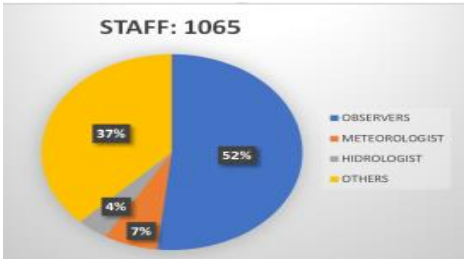
- **Population: ~ 32, 626, 000**
- **Physical context: ~ 1, 285, 215 million km²**

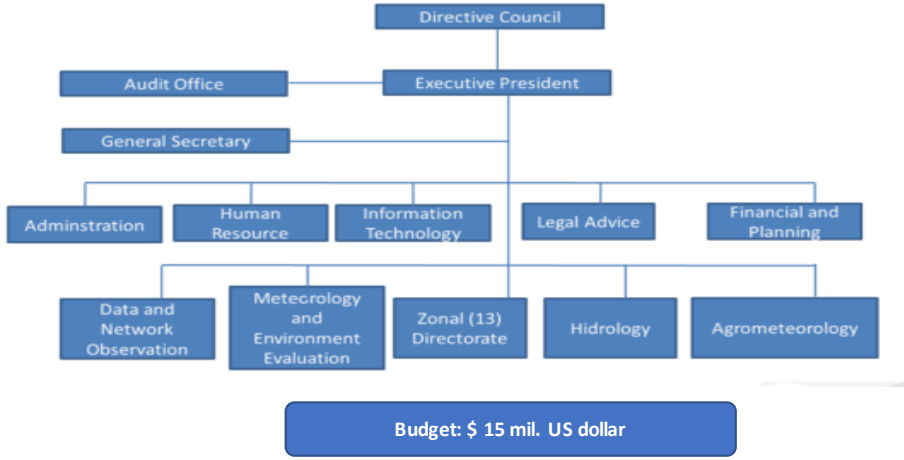
  Peru is typically divided into three main topographical zones. These are: (a) the narrow plains of the coast (costa), (b) the central highlands and valleys (sierra), and (c) the forested expanse of eastern Amazonia (selva).

- **Climate: Peru has 38 climate types, due to the interaction between the different climatic factors that affect it and its geographical position in the tropics, the Andes Mountain range, which configures complex physiography. Among the largest climates we have the arid and temperate on the coast, rainy and cold in the mountains, and very rainy and hot in the jungle.**

INTRODUCTION TO SENAMHI

Mandate: The National Service of Meteorology and Hydrology of Peru - SENAMHI, is a public agency under the Ministry of the Environment. SENAMHI aims to generate and provide information and meteorological, hydrological and climatic knowledge in a reliable, timely and accessible manner for the benefit of Peruvian society.





Budget: $ 15 mil. US dollar

SUMMARY OF NATIONAL OBSERVING CAPABILITIES

CURRENT SITUATION

1014 STATIONS

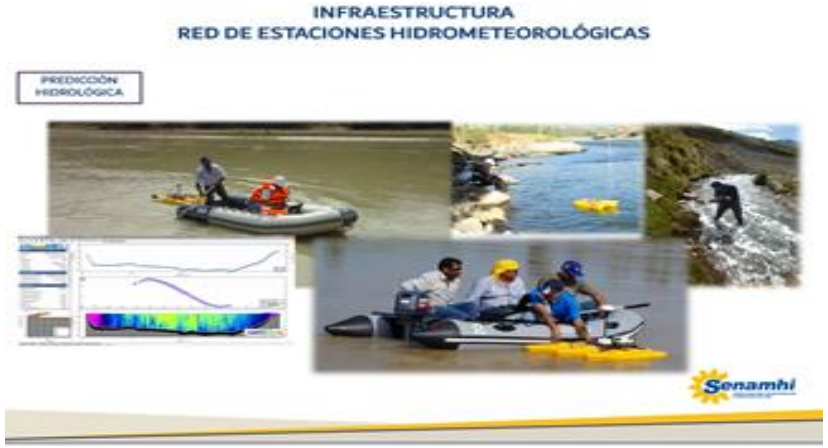
340 AWS

674 MANUAL STATIONS (97 MANUAL RAINGAGES)

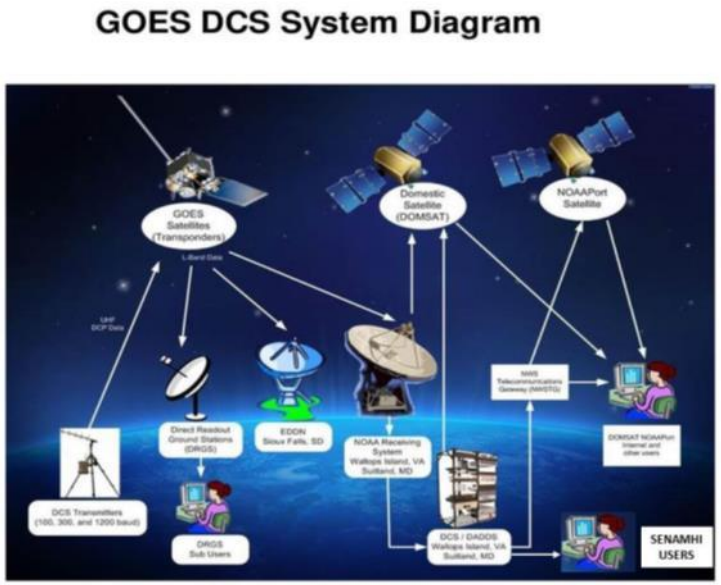
NAVY
~ 10 Ocean- meteorological stations

https://linkshortner.net/RIEti

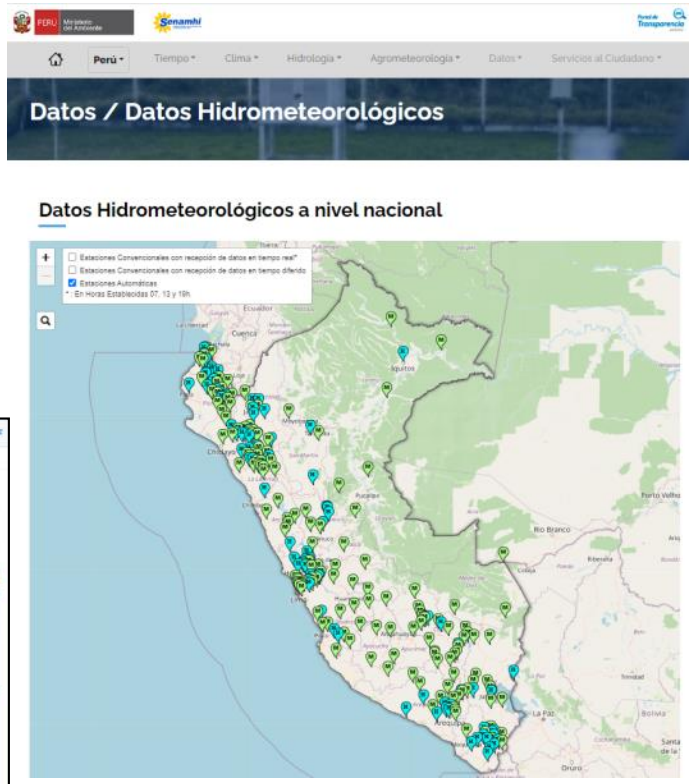
NATIONAL WATER AUTORITY
~ 100 Hydrometeorological stations

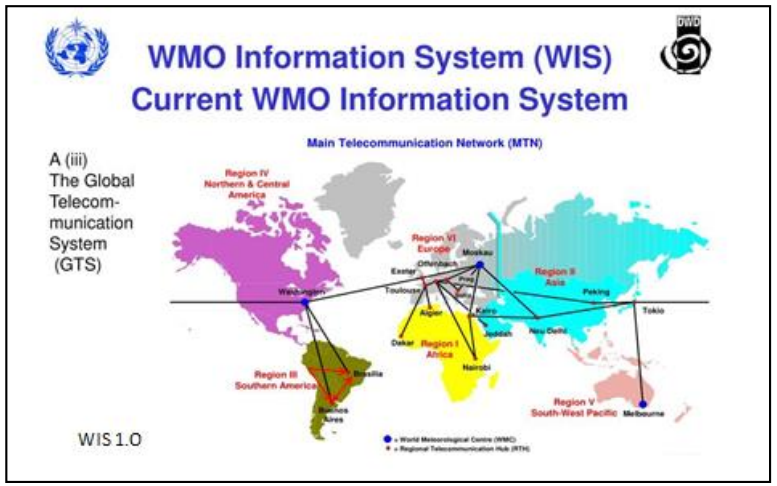


NMHS – SENAMHI
GOES DCS DCP (AUTOMATIC WEATHER STATIONS)



METEOROLOGICAL AND HYDROLOGYCAL STATIONS
(~ 300 STATIONS)

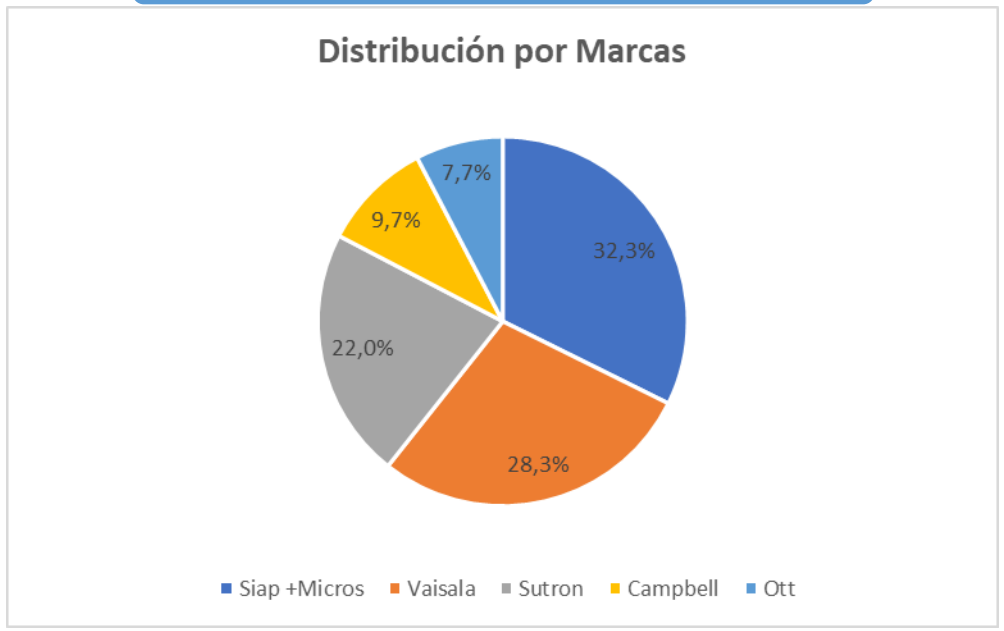




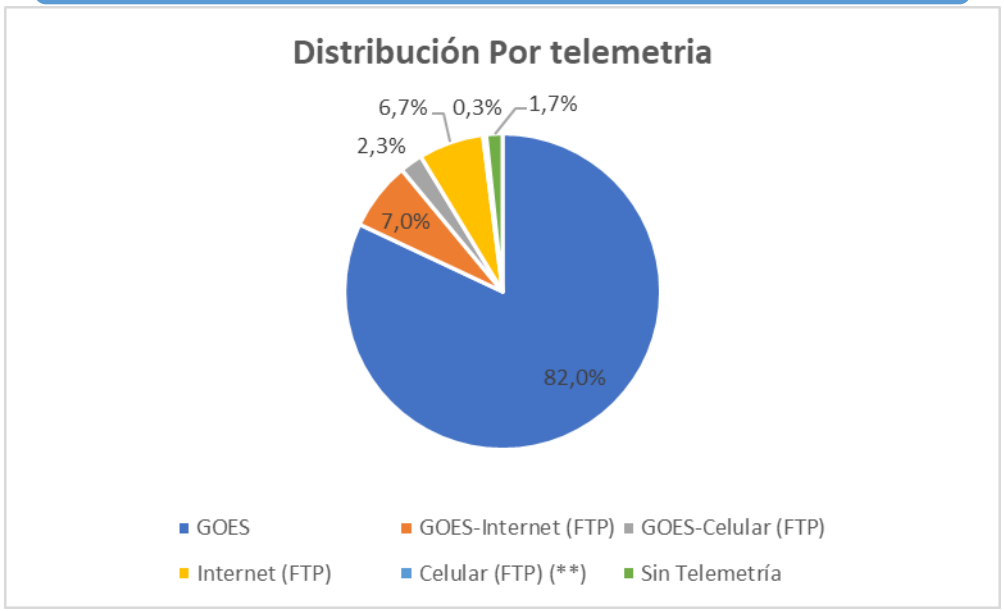
https://www.senamhi.gob.pe/?p=estaciones

SENAMHI'S Automatic Weather Stations

BRANDS



DATA ACCES/TELEMETRY



Picture: Stefany Bejarano

GOES DCS DATA APPLICATIONS AND USERS

- Weather Forecasting
- Water resource management
- Flood warning
- Climate monitoring
- Water level monitoring
- Weather observations (RBON/GBON WMO NETWORKS)

GOES DCS DATA APPLICATIONS AND USERS

- National Service of Meteorology and Hydrology of Peru
- National Water Authority
- Ministry of Agriculture and Irrigation (PSI project)
- Ministry of Transport and Communications
- Power Generation Company (EDEGEL)
- Drinking Water and Sewerage Service of Lima (SEDAPAL)
- Regional Governments (Apurimac, Ayacucho)

ROLLOVER EVENT

GPS ROLLOVER.-

The GPS satellites send a 10-digit binary communication message to Earth (auto station GPS antenna) with a “week number” counting from 0000 to 1023. Once the maximum coded week of 1024 (which carries 19.7 years), the week number value is reset to 0000. The GPS antenna clock will reset to zero, which is programmed by internal software (firmware).

Deadline of Rollover

March, 19 2023

Last Rollover

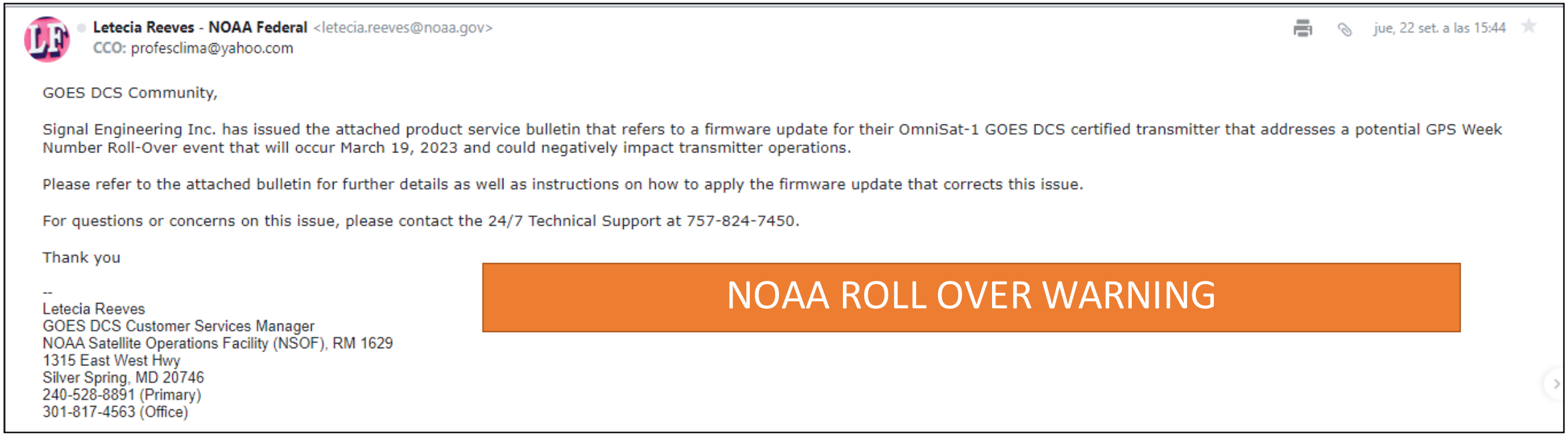
April, 6 2019

https://www.researchgate.net/publication/340066251_Poster_Jorge_Chira_NOAA_AMS

Possible Impact

The possible interruption of the data transmission of all the automatic stations of any organization that use this type of sa tellite transmitter. (Reliable data will not be stored in the memory of the data logger of the automatic weather station.)

ROLLOVER EVENT



Letecia Reeves - NOAA Federal <letecia.reeves@noaa.gov>
CCO: profesclima@yahoo.com

jue, 22 set. a las 15:44

GOES DCS Community,

Signal Engineering Inc. has issued the attached product service bulletin that refers to a firmware update for their OmniSat-1 GOES DCS certified transmitter that addresses a potential GPS Week Number Roll-Over event that will occur March 19, 2023 and could negatively impact transmitter operations.

Please refer to the attached bulletin for further details as well as instructions on how to apply the firmware update that corrects this issue.

For questions or concerns on this issue, please contact the 24/7 Technical Support at 757-824-7450.

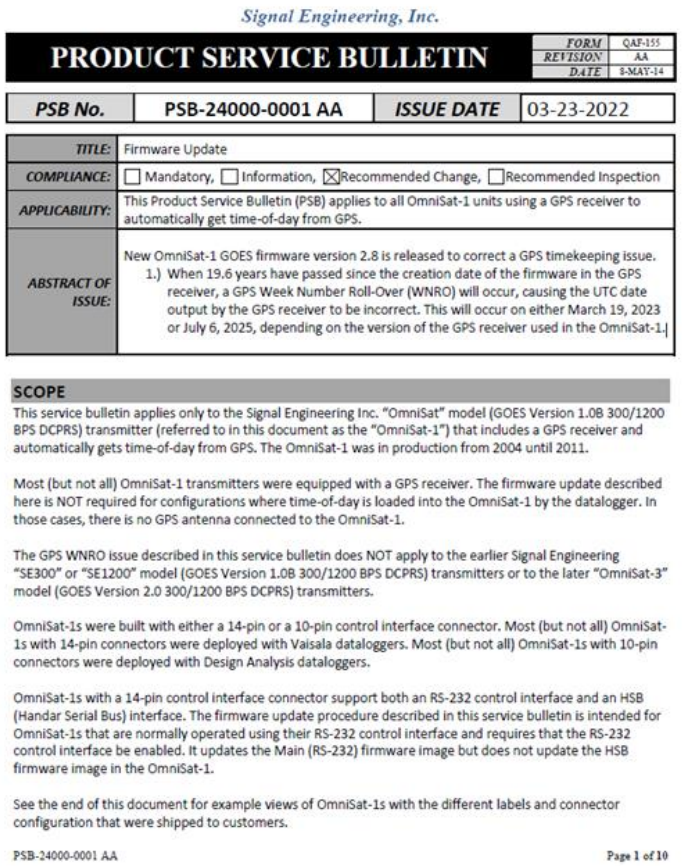
Thank you

--
Letecia Reeves
GOES DCS Customer Services Manager
NOAA Satellite Operations Facility (NSOF), RM 1629
1315 East West Hwy
Silver Spring, MD 20746
240-528-8891 (Primary)
301-817-4563 (Office)

NOAA ROLL OVER WARNING

ON SEPTEMBER 22, 2022, NOAA ALERTS THAT OMNISAT-1 TRANSMITTER WOULD BE AFFECTED BY THE ROLLOVER EVENT

ROLLOVER EVENT



Signal Engineering, Inc.

PRODUCT SERVICE BULLETIN

FORM	QAF-155
REVISION	AA
DATE	8-MAY-14

PSB No.	PSB-24000-0001 AA	ISSUE DATE	03-23-2022

TITLE:	Firmware Update
COMPLIANCE:	☐ Mandatory, ☐ Information, ☒ Recommended Change, ☐ Recommended Inspection
APPLICABILITY:	This Product Service Bulletin (PSB) applies to all OmniSat-1 units using a GPS receiver to automatically get time-of-day from GPS.
ABSTRACT OF ISSUE:	New OmniSat-1 GOES firmware version 2.8 is released to correct a GPS timekeeping issue. 1.) When 19.6 years have passed since the creation date of the firmware in the GPS receiver, a GPS Week Number Roll-Over (WNRO) will occur, causing the UTC date output by the GPS receiver to be incorrect. This will occur on either March 19, 2023 or July 6, 2025, depending on the version of the GPS receiver used in the OmniSat-1.

SCOPE

This service bulletin applies only to the Signal Engineering Inc. "OmniSat" model (GOES Version 1.0B 300/1200 BPS DCPRS) transmitter (referred to in this document as the "OmniSat-1") that includes a GPS receiver and automatically gets time-of-day from GPS. The OmniSat-1 was in production from 2004 until 2011.

Most (but not all) OmniSat-1 transmitters were equipped with a GPS receiver. The firmware update described here is NOT required for configurations where time-of-day is loaded into the OmniSat-1 by the datalogger. In those cases, there is no GPS antenna connected to the OmniSat-1.

The GPS WNRO issue described in this service bulletin does NOT apply to the earlier Signal Engineering "SE300" or "SE1200" model (GOES Version 1.0B 300/1200 BPS DCPRS) transmitters or to the later "OmniSat-3" model (GOES Version 2.0 300/1200 BPS DCPRS) transmitters.

OmniSat-1s were built with either a 14-pin or a 10-pin control interface connector. Most (but not all) OmniSat-1s with 14-pin connectors were deployed with Vaisala dataloggers. Most (but not all) OmniSat-1s with 10-pin connectors were deployed with Design Analysis dataloggers.

OmniSat-1s with a 14-pin control interface connector support both an RS-232 control interface and an HSB (Handar Serial Bus) interface. The firmware update procedure described in this service bulletin is intended for OmniSat-1s that are normally operated using their RS-232 control interface and requires that the RS-232 control interface be enabled. It updates the Main (RS-232) firmware image but does not update the HSB firmware image in the OmniSat-1.

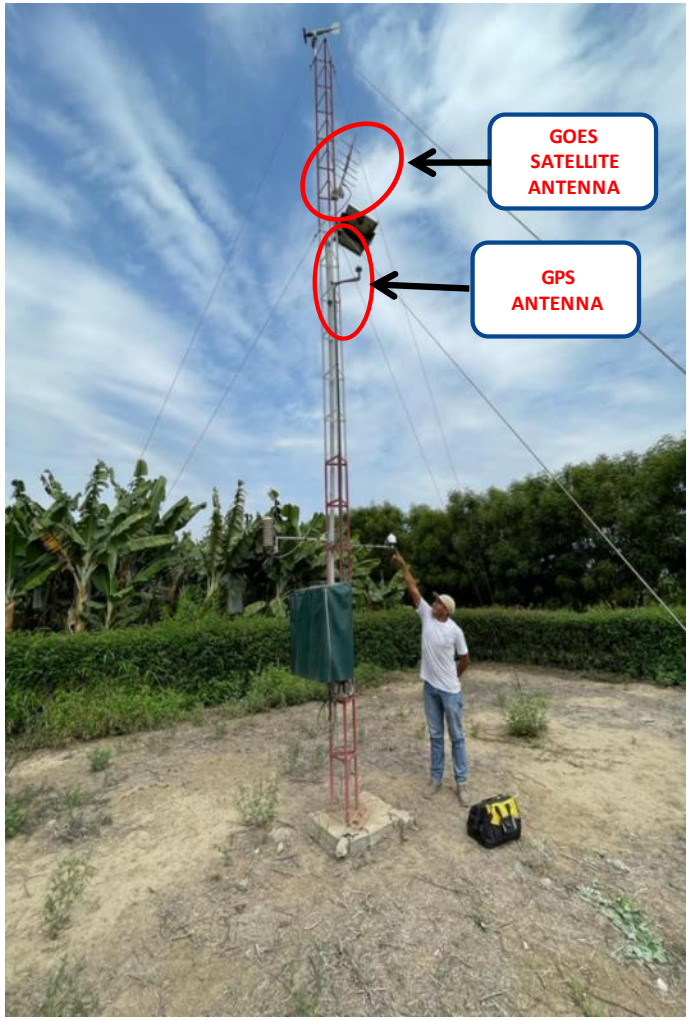
See the end of this document for example views of OmniSat-1s with the different labels and connector configuration that were shipped to customers.

PSB-24000-0001 AA Page 1 of 10

THE COMPANY SIGNAL ENGINEERING, INC, GAVE DETAILS OF THE AFFECTATION

ROLLOVER EVENT

Satellite and GPS Antennas



ROLLOVER EVENT

Satellite Transmitter

SENAMHI ACTIONS TO OVERCOME ROLLOVER EVENT

- NMHS had not planned any travel commissions regarding the Rollover event, in fact, there was no budget in 2022 to resolve this issue.
- Budget availability would only be available ending February 2023
- Some local offices do not have technicians to sort out the Rollover impact
- The rainy season in Peru begins in September and lasts until March of the next year. At that time, some roads are affected by landslides caused by the rains, making it difficult to move throughout the country to update the data loggers firmware of the affected DCPs.

BBC Sign in Home News Sport Reel Worklife Tra

NEWS

Home | War in Ukraine | Climate | Video | World | US & Canada | UK | Business | Tech | Science

World | Africa | Asia | Australia | Europe | Latin America | Middle East

Peru protests: Roads and airport blocked in anger at new president

13 December 2022

CRISIS24 Solutions & Expertise | Insights & Intelligence | Our Experts | Careers | About Us | Book a Demo

09 DEC 2022 | 03:57 PM UTC

Peru: Protests and roadblocks reported across country following arrest of President Pedro Castillo and transfer of power Dec. 7 /update 3

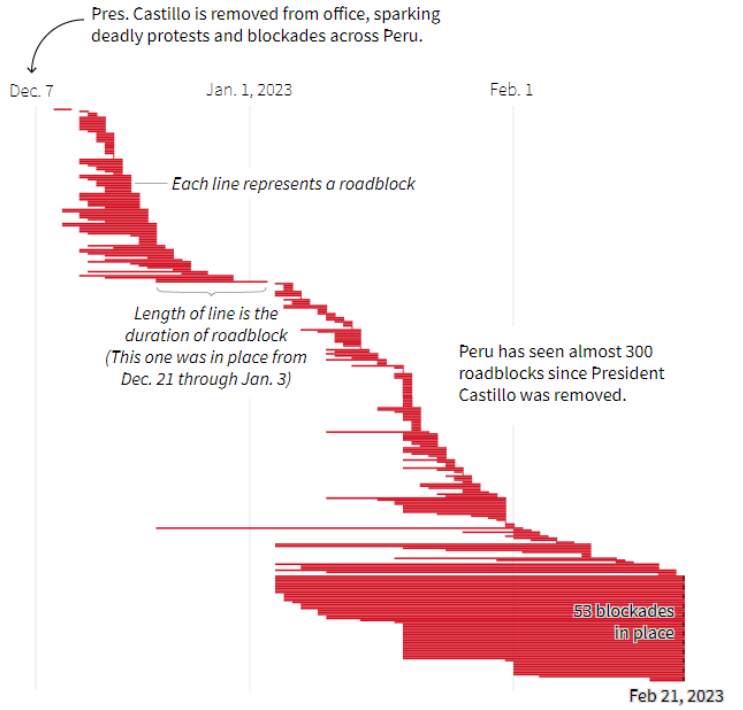
Protests, roadblocks reported across Peru after arrest of President Pedro Castillo, transfer of power Dec. 7; lingering disruptions likely.

Critical | Legal | Security | Transportation | PER

REUTERS World | Business | Legal | Markets | Breakingviews | Technology | Investigations | More

Roadblocks in Peru

The quantity and duration of roadblocks over the last two and a half months in Peru.



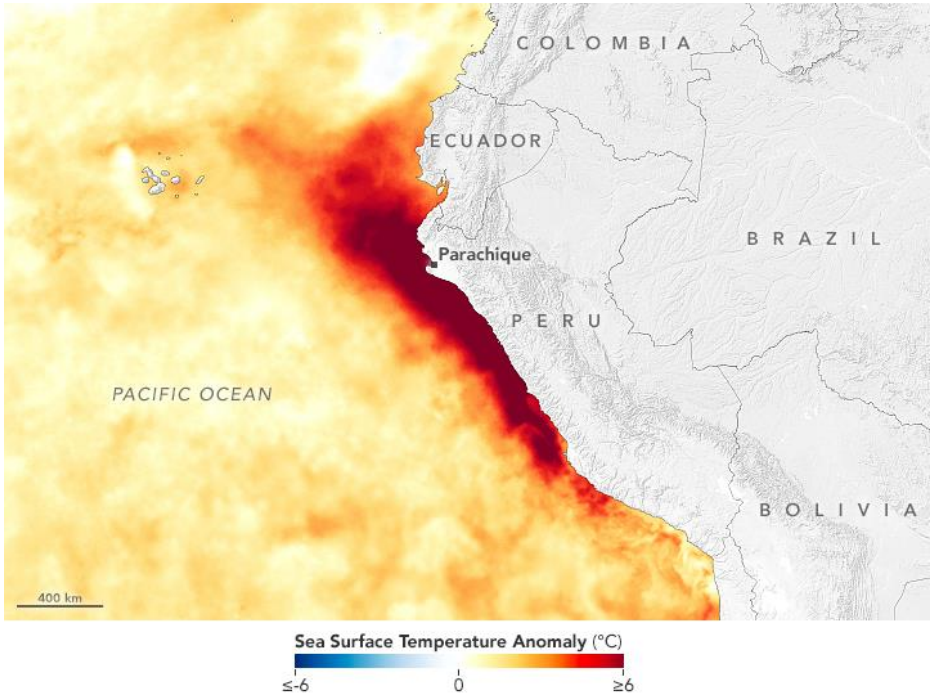
PERU BLOCKADED

Peruvian political protesters have sustained roadblocks for over two months across the south of the country, interrupting commerce and tourism

By Travis Hartman and Alexander Villegas

PUBLISHED FEB. 23, 2023

LEER IN ESPANOL



https://earthobservatory.nasa.gov/images/151183/warming-water-and-downpours-in-peru

gob.pe | Unique digital platform of the Peruvian State

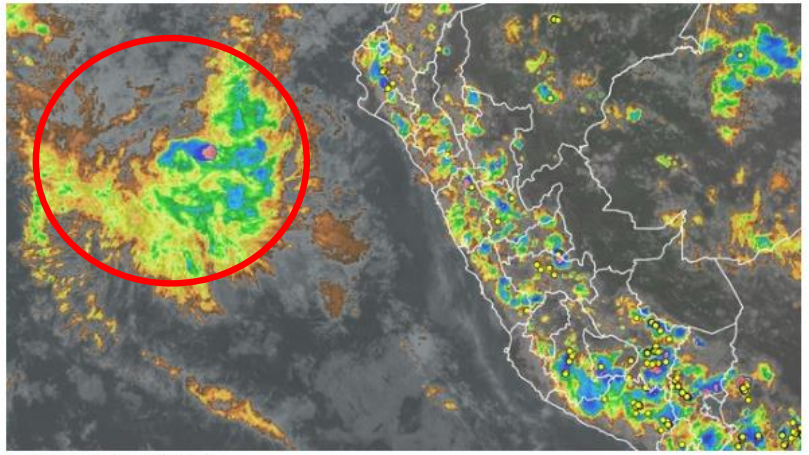
Start > The state > MINAM > SENAMHI > News > Cyclone Yaku appears in front of the Peruvian sea

National Service of Meteorology and Hydrology of Peru

Cyclone Yaku appears in front of the Peruvian sea

Press release

Unorganized system of tropical characteristics influences the extreme rainfall in the north coast of the country.

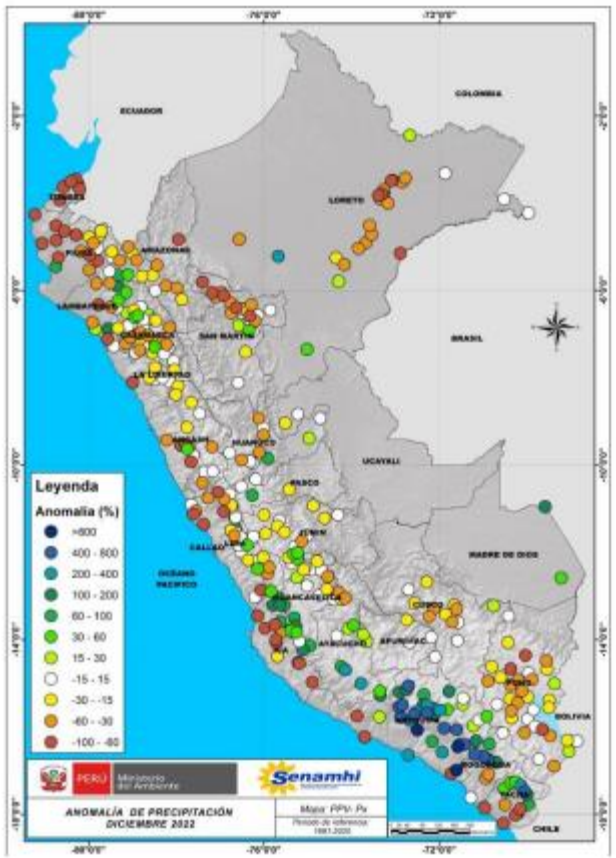


March 7, 2023 - 6:47 p.m.

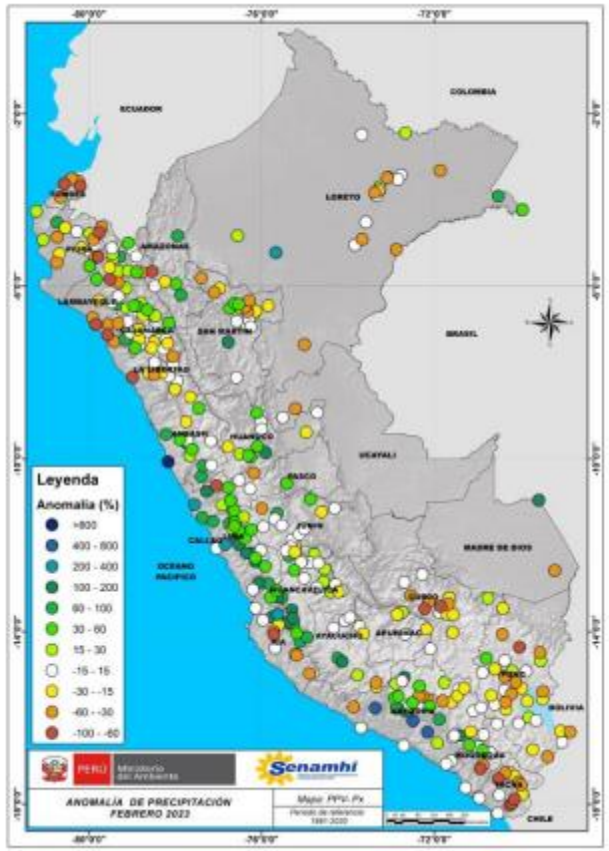
The National Meteorology and Hydrology Service of Peru (Senamhi) reports that, off the north and central coast of Peru, there is an unusual "unorganized tropical cyclone." This clockwise low pressure system is associated with the warming of the sea surface temperature and the second band of the Intertropical Convergence Zone (ITCZ).

https://www.gob.pe/institucion/senamhi/noticias/721545-ciclon-yaku-se-presenta-frente-al-mar-peruano

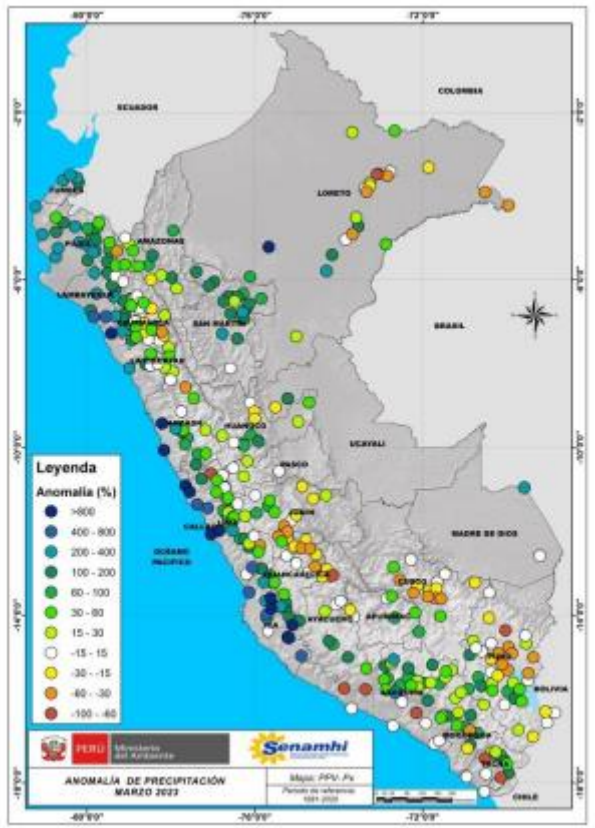
Precipitation Anomalies for December 2022



Precipitation Anomalies for February 2023



Precipitation Anomalies for March 2023



andina
AGENCIA PERUANA DE NOTICIAS

Edición Español

Headlines Politics Business Tourism Nation Miscellaneous Videos

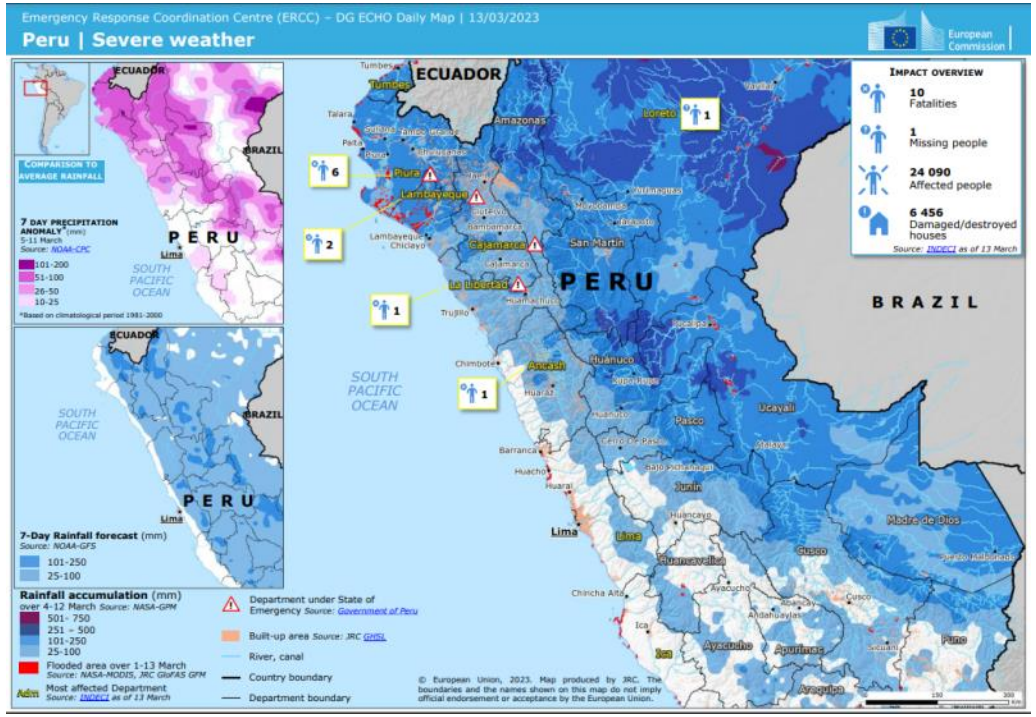
Peru: 592 districts of northern coast, highlands in danger due to heavy rains

14:30 | Lima, Mar. 11.

The National Center for Estimation, Prevention and Disaster Risk Reduction (Cenepred) on Saturday warned that 592 districts in the northern coast and the highlands are at risk of becoming affected by mudslides, landslides, or other types of mass-wasting caused by heavy rains.

According to the risk scenario prepared by said institution, ***Cajamarca region hosts the largest number of districts at very high risk (65).***

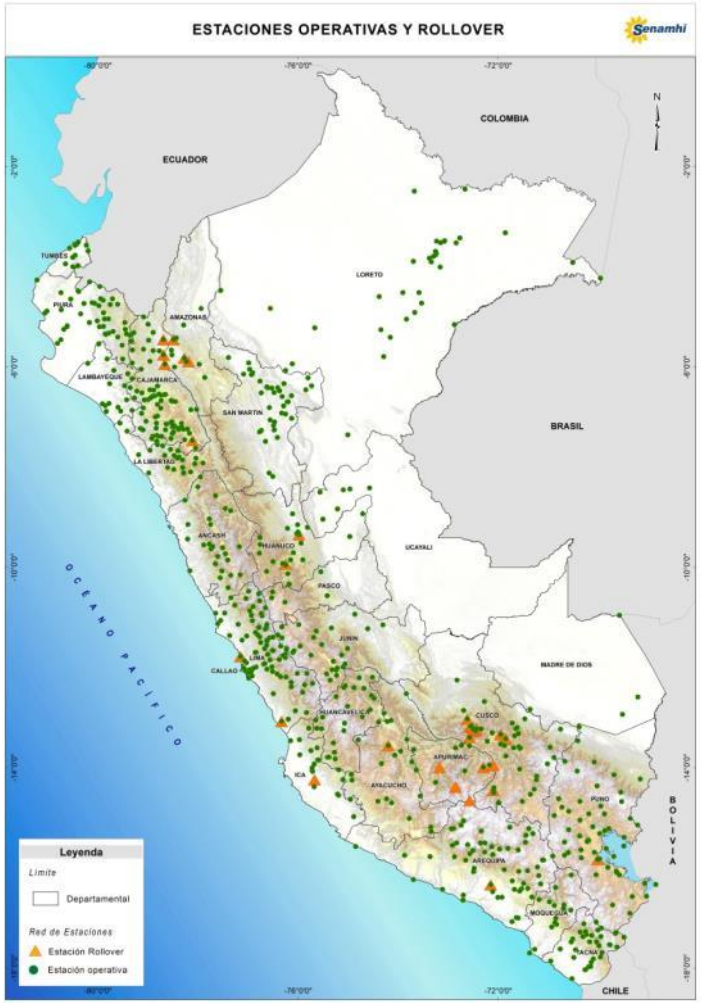
It is followed by: ***Ancash (56), Ayacucho (37), La Libertad (29), Huancavelica (22), Arequipa (21), Lima (20), Piura (17), Apurímac (15), Cusco (6), Lambayeque (3), Tacna (3), Huánuco, Moquegua (1), and Puno (1), making a total of 297 districts.***



https://reliefweb.int/map/peru/peru-severe-weather-dg-echo-daily-map-13032023

Actions

- Potential drawbacks were identified to carry out this activity (lack of budget, roads blocked due to protests against the government, lack of technical personnel in the regions, beginning of the rainy season that could generate road blocks due to rainwater flooding).
- Every detail was carefully planned to carry out the firmware update of DCP. Resources were mobilized, optimizing travel commissions, the respective laboratory tests were carried out and the technical personnel of each region to be affected were trained.
- 31 DCP with OMNISAT 1 satellite transmitter or equivalent that could be affected were identified.
- Coordination was made with local offices to solve the Rollover problem.
- Laboratory tests and on-site verification were carried out
- A firmware repository was organized and firmware requested from vendors was shared with local offices.
- The local offices performed the firmware update for each DCP, except one that was supported by the central office.
- The performance of each DCP was monitored by the central office.
- A satellite transmitter was replaced because it failed when technicians tried to update the DCP firmware.

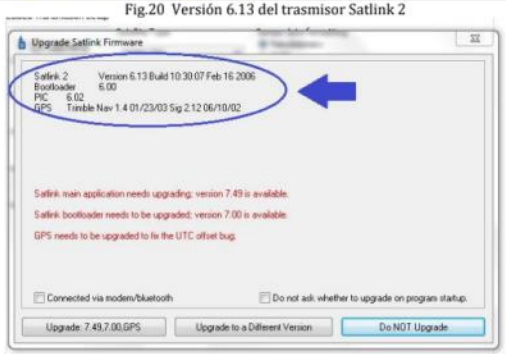


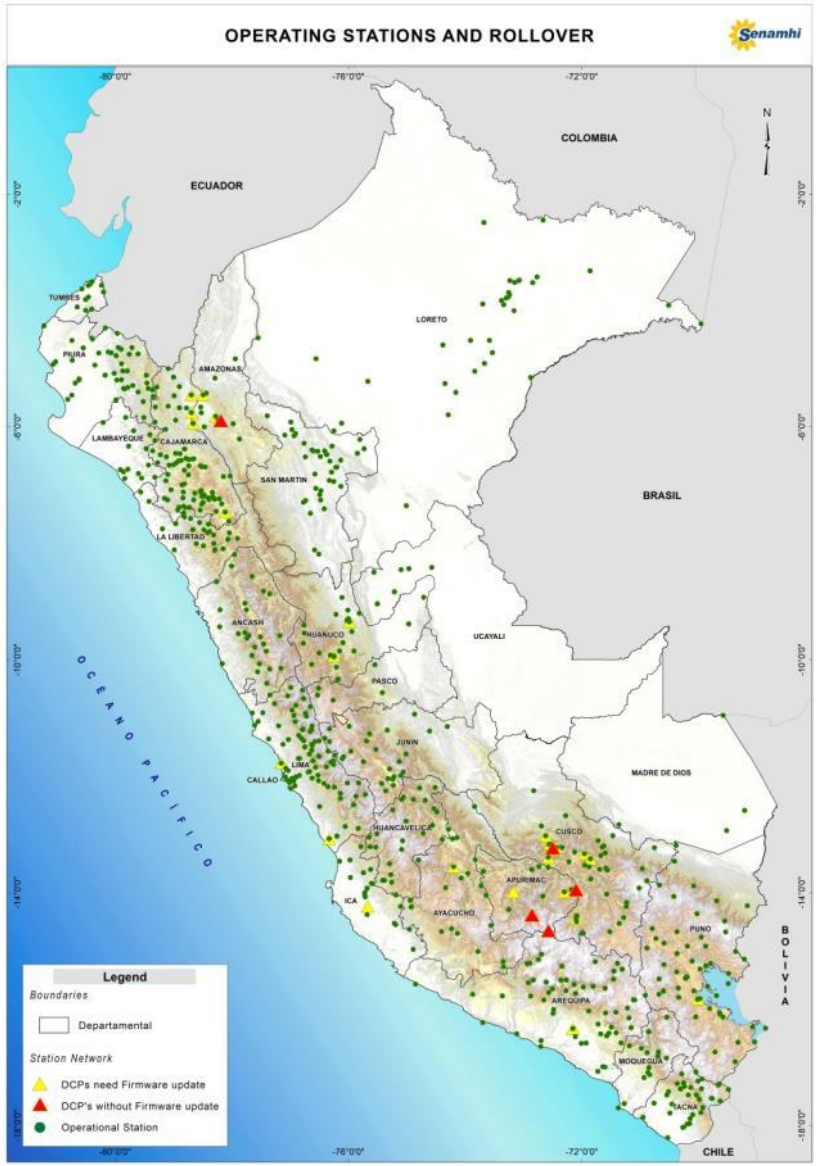
Nº	Name	ID GOES	Latitude	Longitude	Altitude	Type	Brand	TX Model	Owner
1	CORRAL_QUEMADO	472B607A	-5.754611	-78.692083	427	EHA	OTT	Omnisat 1	NMHS
2	CUMBA	472B3006	-5.941353	-78.664133	449	EHA	OTT	Omnisat 1	NMHS
3	HUALLAPE	472A571A	-5.450769	-78.695792	409	EHA	OTT	Omnisat 1	NMHS
4	MAGUNCHAL	472B2370	-5.889872	-78.188763	616	EHA	OTT	Omnisat 1	NMHS
5	NARANJITO	472327D6	-5.819681	-78.275983	500	EHA	OTT	Omnisat 1	NMHS
6	PUENTE_SALINAS_AMOJAO	472B55E0	-5.450961	-78.489400	381	EHA	OTT	Omnisat 1	NMHS
7	CRISNEJAS	472A32FC	-7.463889	-78.113056	1991	EHA	OTT	Omnisat 1	NMHS
8	ANTONIO_RAIMONDI	472A218A	-11.776060	-77.151390	47	EMA	Vaisala	V1001200	NMHS
9	CAÑETE	472A0766	-13.074672	-76.330406	116	EMA	Vaisala	V1001200	NMHS
10	BETA_SANTIAGO	47E9F488	-14.237400	-75.670244	379	EMA	Vaisala	V1001200	NMHS
11	PAMPA_DE_ MAJES	4729E39A	-16.335623	-72.152478	1503	EMA	Vaisala	V1001200	NMHS
12	CHINCHAVITO	472D0552	-9.934825	-76.249658	795	EHA	OTT	Omnisat 1	NMHS
13	PUENTE_TARUCA	472B730C	-9.346995	-75.982347	1825	EHA	OTT	Omnisat 1	NMHS
14	PAMPA_CANGALLO	4729D600	-13.555400	-74.197890	3355	EMA	Vaisala	V1001200	NMHS
15	CALCA	4720589A	-13.333298	-71.955292	2921	EMA	Vaisala	V1001200	NMHS
16	CASACCANCHA	472A1410	-13.989233	-72.298319	4050	EMA	Vaisala	V1001200	NMHS
17	HUAYLLABAMBA	47203D7C	-13.265806	-72.448806	2995	EMA	Vaisala	V1001200	NMHS
18	INTIHUATANA_H	472935F2	-13.185185	-72.523232	2156	EHA	Vaisala	V1001200	NMHS
19	INTIIHUATANA_M	472852EE	-13.174140	-72.560495	1788	EMA	Vaisala	V1001200	NMHS
20	MACHUPICCHU	472008E6.	-13.166550	-72.545850	2399	EMA	Vaisala	V1001200	NMHS
21	NUEVO_PISAC	472A6280	-13.422639	-71.853881	2966	EHMA	Vaisala	V1001200	NMHS
22	PACAYMAYO	4729950A	-13.234189	-72.498408	3615	EMA	Vaisala	V1001200	NMHS
23	QORIHUAYRACHINA	47206D00	-13.224194	-72.433833	2517	EMA	Vaisala	V1001200	NMHS
24	SAN_PABLO	47208EF2	-13.025060	-72.619880	1228	EMA	Vaisala	V1001200	NMHS
25	SANTO_TOMAS	4729A090	-14.448961	-72.096450	3671	EMA	Vaisala	V1001200	NMHS
26	SORAYPAMPA	47204BEC	-13.394777	-72.573544	3854	EMA	Vaisala	V1001200	NMHS
27	PUNO	472DD33A	-15.826342	-70.012133	3812	EMA	Vaisala	V1001200	NMHS
28	PUNANQUI	472AF7E2	-13,95139	-72,10047	2701	EHA	Vaisala	V1001200	RG
29	SANTA ROSA	472AE494	13,99183	-73,17481	2263	EHA	Vaisala	V1001200	RG
30	ANTABAMBA	472B059C	-14,38483	-72,85628	3845	EMA	Vaisala	V1001200	RG
31	HUACULLO	472B16EA	-14,65289	-72,57275	4672	EMA	Vaisala	V1001200	RG

NMHS: National Meteorological and Hydrological Service
RG: Regional Government

Picture: Jonathan Sanchez

Fig.20 Versión 6.13 del trasmisor Satlink 2




OPERATING STATIONS AND ROLLOVER
Senamhi
COLOMBIA
ECUADOR
BRASIL
BOLIVIA
CHILE
OCEANO PACIFICO
TUMBES
PIURA
LORETO
AMAZONAS
LAMBAYEQUE
CAJAMARCA
SAN MARTIN
LA LIBERTAD
ANCASH
HUANUCO
UCAYALI
PASCO
JUNIN
LIMA
CALLAO
MADRE DE DIOS
HUANCAVELICA
CUSCO
APURIMAC
ICA
AYACUCHO
PUNO
AREQUIPA
MOQUEGUA
TACNA
Legend
Boundaries
Departamental
Station Network
DCPs need Firmware update
DCP's without Firmware update
Operational Station

Results

- The firmware of most DCPs was updated, except for 5 DCPs that still are working but are in risk of fail.
- One DCP is inoperative due to other failures. Another DCP was not updated due to lack of budget but is expected to be updated next June.
- Just 3 DCPs belonging to a regional government could not be updated due to limitations of that organization.
- The rollover event did not cause a great impact thanks to the rapid intervention of the NMHS, which despite the difficulties encountered was able to solve this problem.

SUMMARY

- The data generated by the DCPs that use the GOES DCS are important for several organizations that generate services for decision-making in Peru, in addition to contributing to the international exchange of data with the World Meteorological Organization (WMO), in support of numerical weather prediction.
- NOAA warned of the possible impact of Rollover on DCPs in Peru, specifically the Omnisat satellite transmitter model of the company SIGNAL ENGINEERING, INC., which had to be updated before the Rollover impact date.
- NMHS of Peru identified the possible DCPs to be affected, and which should be updated before the Rollover impact date. Solving this event meant a great effort on the part of SENAMHI, due to several obstacles that arose: budgetary, political agitation, severe weather, among others.
- From the initial list of 31 DCPs that required attention, 26 were updated with firmware; one DCP is inoperative and the rest continue to work and have not been affected by the Rollover event but they can fail at any time if they have an electrical fault, so SENAMHI is expected to update the 5 remaining DCP firmware shortly.
- Thanks to the actions carried out and the notice from NOAA, the Rollover impact has been minimal and the data from the DCP can continue to support decision-making at the national level and contribute to the international exchange of data with WMO.