

Geodetic Reference Frame, Infrastructure and Their Applications in Indonesia

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Workshop on Geodetic Reference Frame – WG1 UN-GGIM-AP

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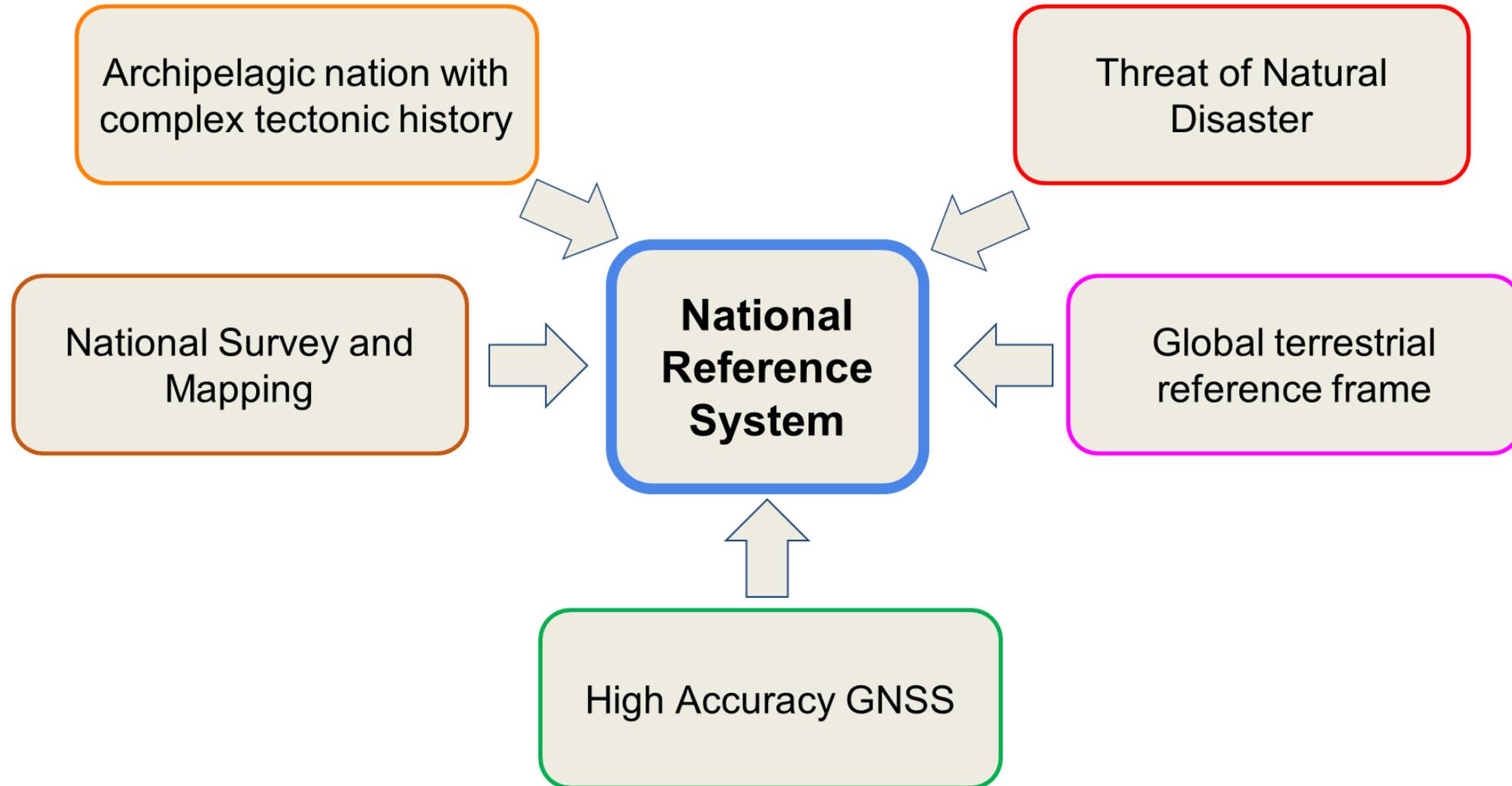
Organized by:



Pointer

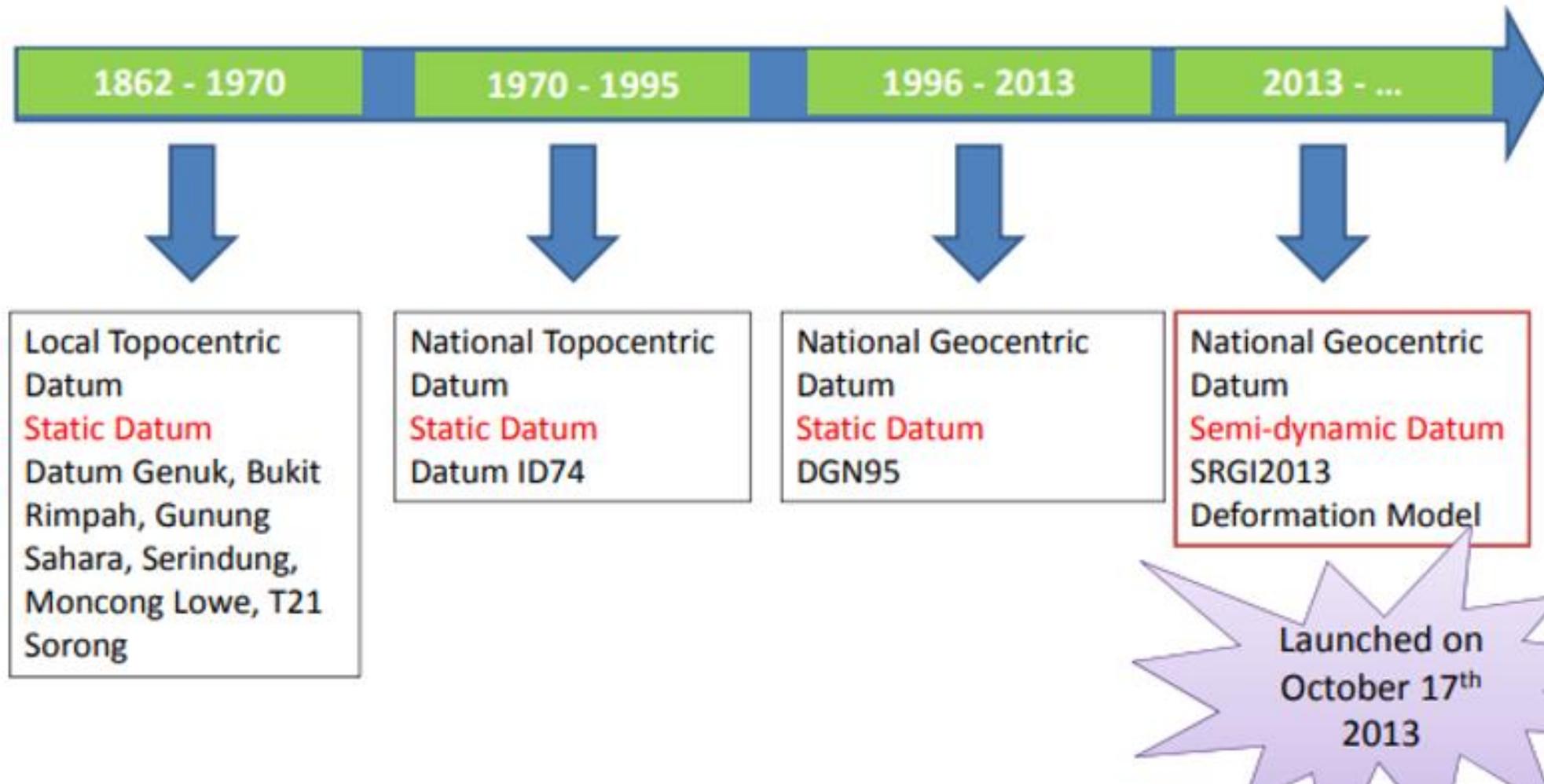
1. Background
2. Indonesia Geospatial Reference System 2013 (SRGI2013)
3. Current Status of National Geodetic Infrastructure
4. Some Applications of National Geodetic Infrastructure
5. Summary

Background





History of Indonesian Geodetic Datum Development



Indonesia Geospatial Reference System (IGRS)

- First launched in 17 October 2013.
- IGRS is a geospatial reference system which is used nationally and consistent for all Indonesian area and it is compatible with the global geospatial reference system (ITRS).
- Consists of:
 - a. Horizontal Geospatial Reference System; and
 - b. Vertical Geospatial Reference System



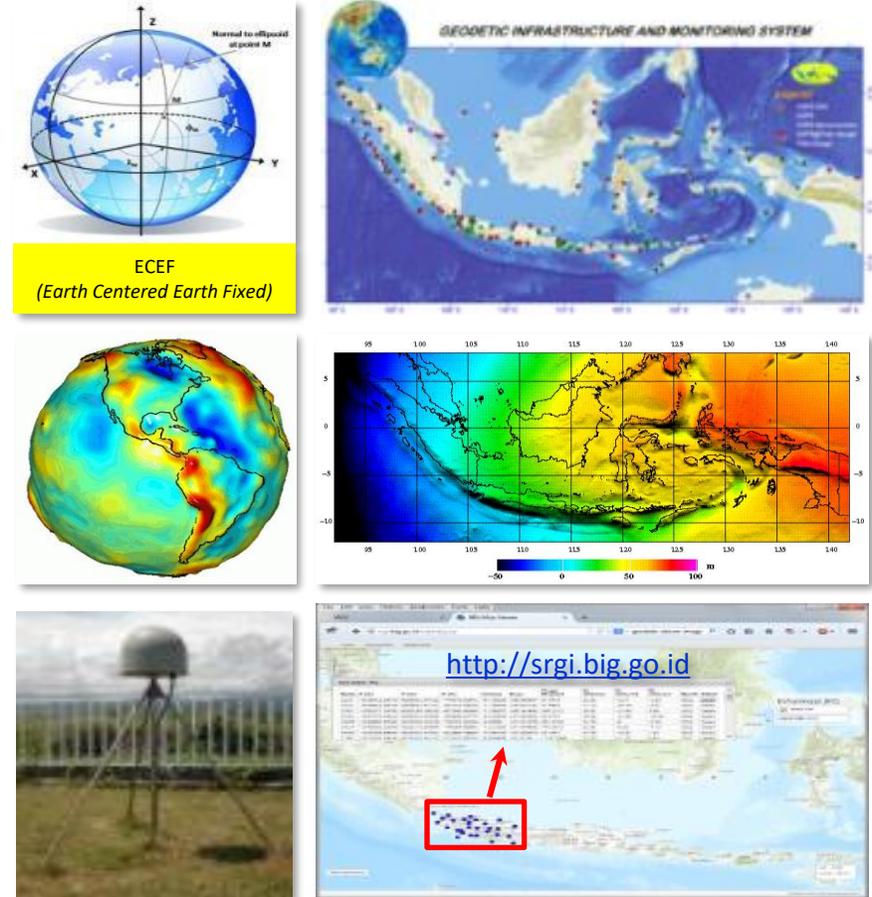
Indonesian Geospatial Reference System (IGRS)

1. Horizontal Geospatial Reference System - SRGI2013 (2021.0)

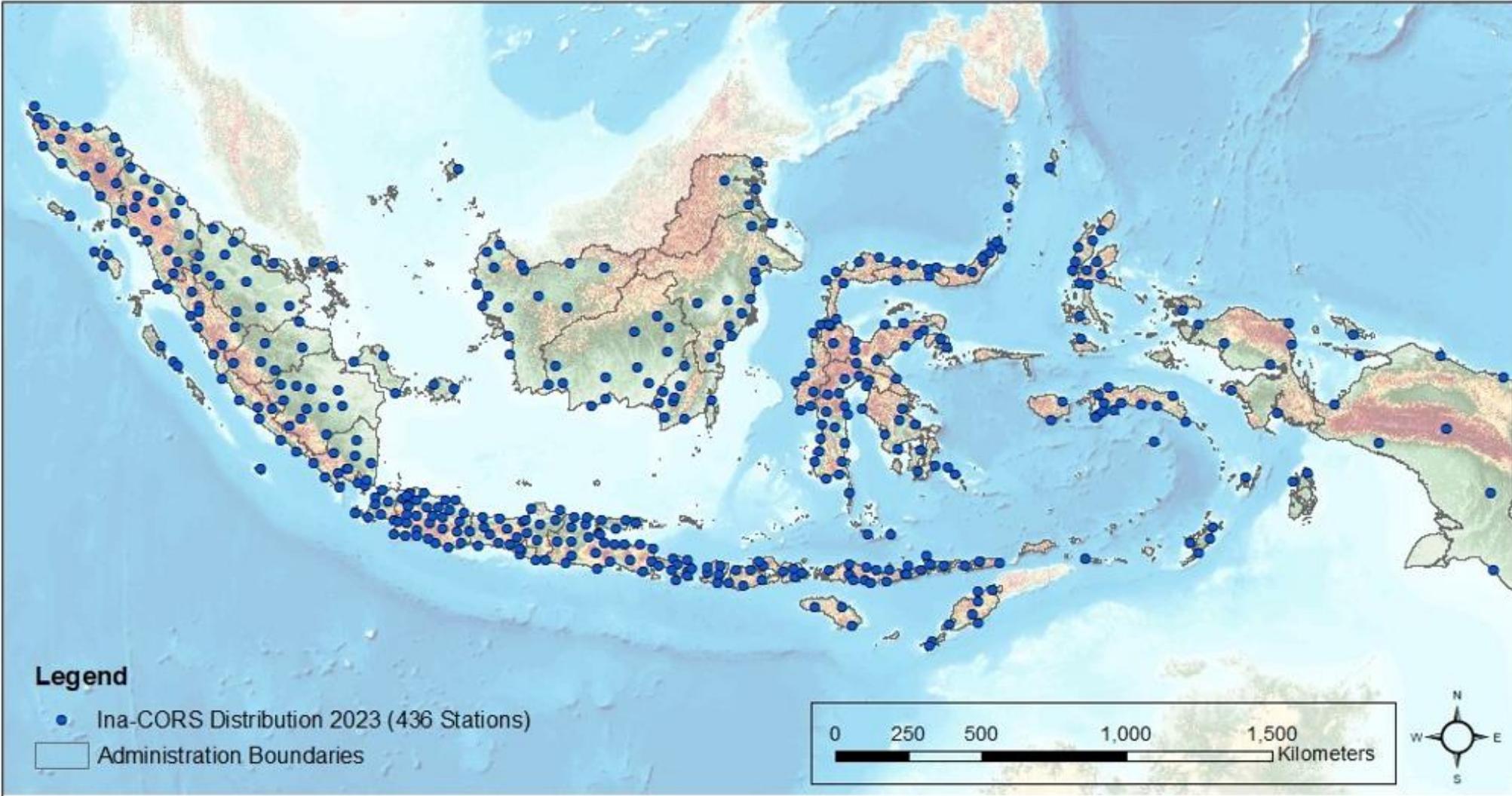
- Coordinate Reference System** → *International Reference Terrestrial System (ITRS)*;
- Coordinate Reference Frame** → Geodetic Control Network with set of coordinate at certain epoch (1 January 2021) and connected to global terrestrial reference frame (ITRF2014) or its update
- Geodetic Datum** → WGS84;
- The change of coordinate over time** (velocity rate) → V_x, V_y, V_z .

2. Vertical Geospatial Reference System:

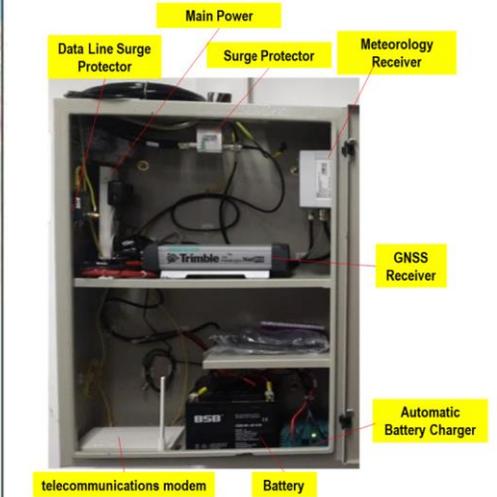
- Geoid** → InaGEOID 2020; and
- Tidal Datum** → HAT, MHWS, MSL, MLWS, LAT.



Geodetic Control Network (Indonesian CORS Station Distribution)

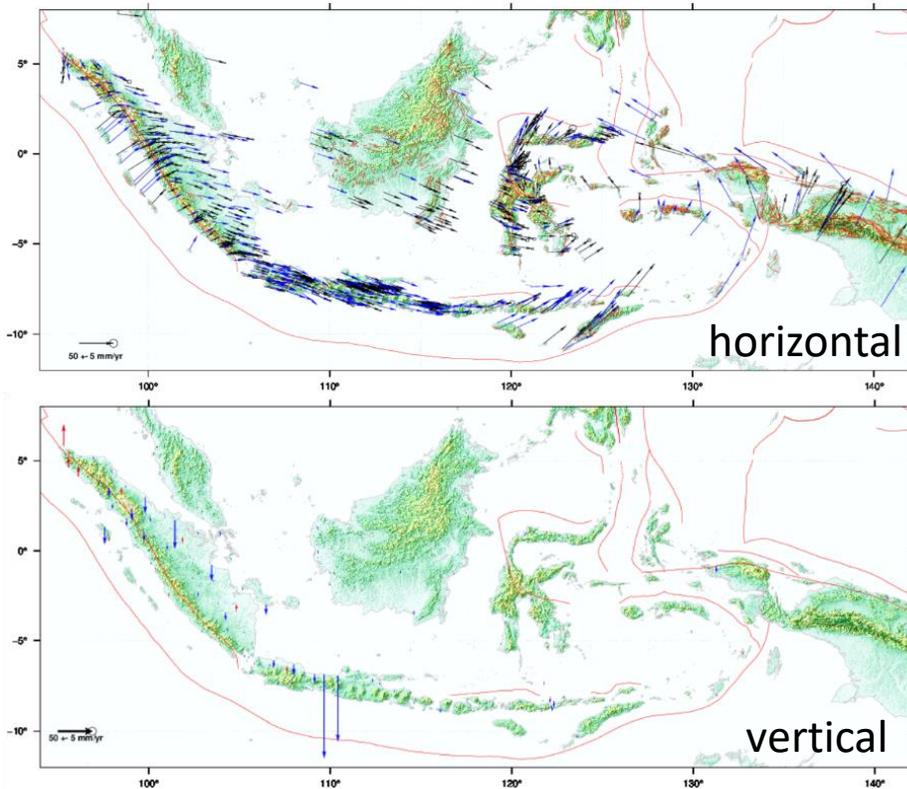


Concrete Monument

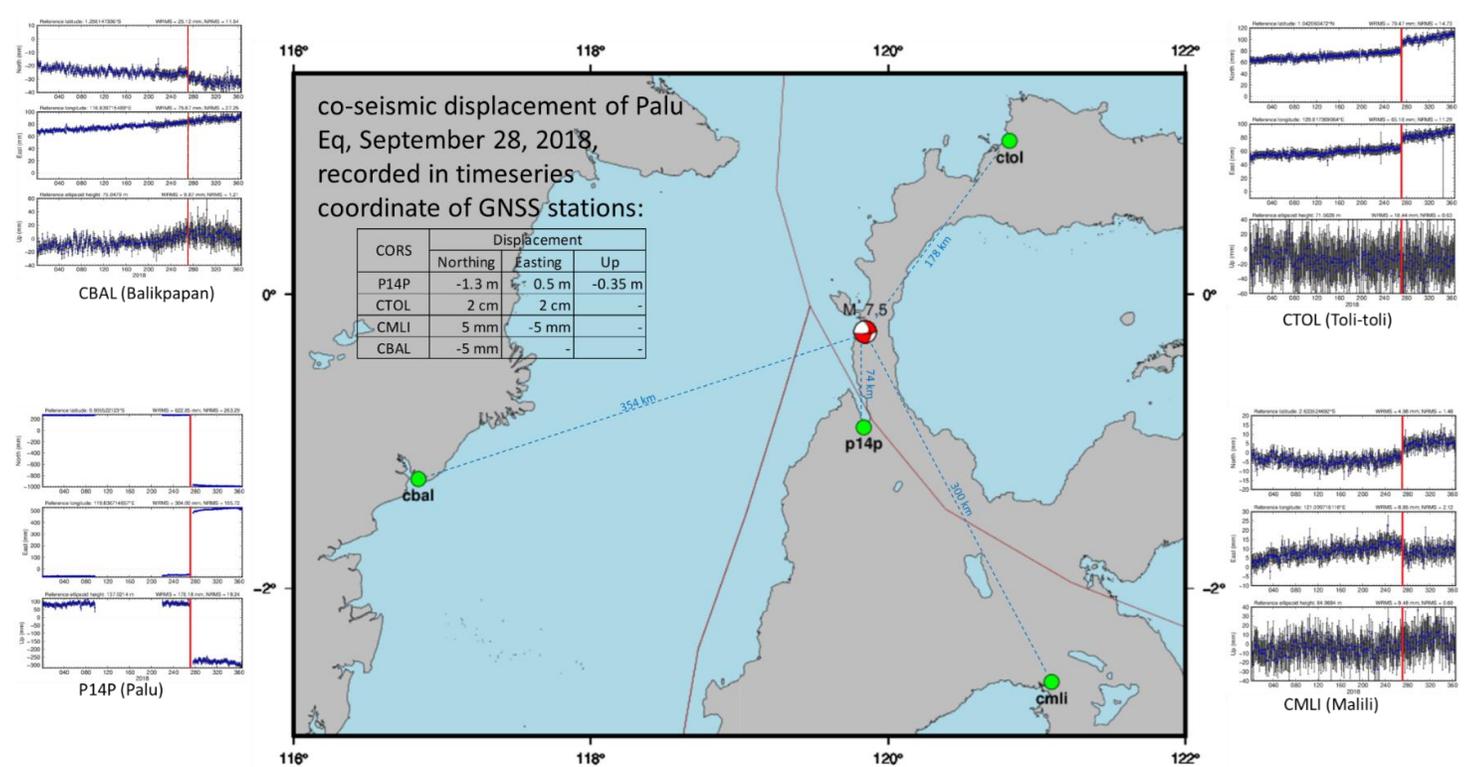


Ina-CORS is used to monitor the tectonic plate movement and maintain geospatial reference frame accuracy

velocity rate vector

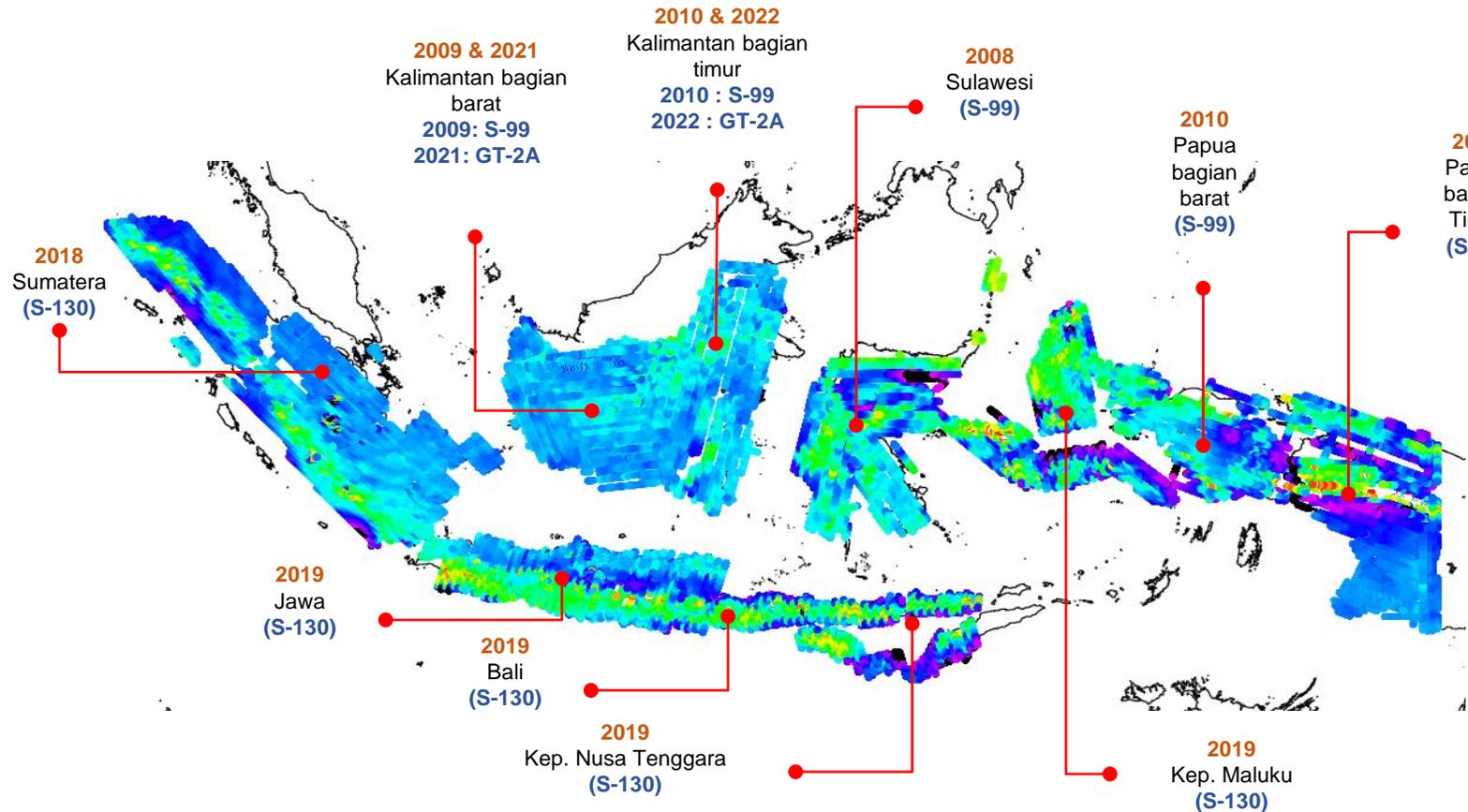


co-seismic displacement



THE GRAVITY DATASET AND INFRASTRUCTURES TO DEFINE INDONESIAN GEOID (INAGEOID)

The Distribution of Gravity Anomaly Generated from Airborne Gravity Surveys in Indonesia (for years 2008 up to 2022)

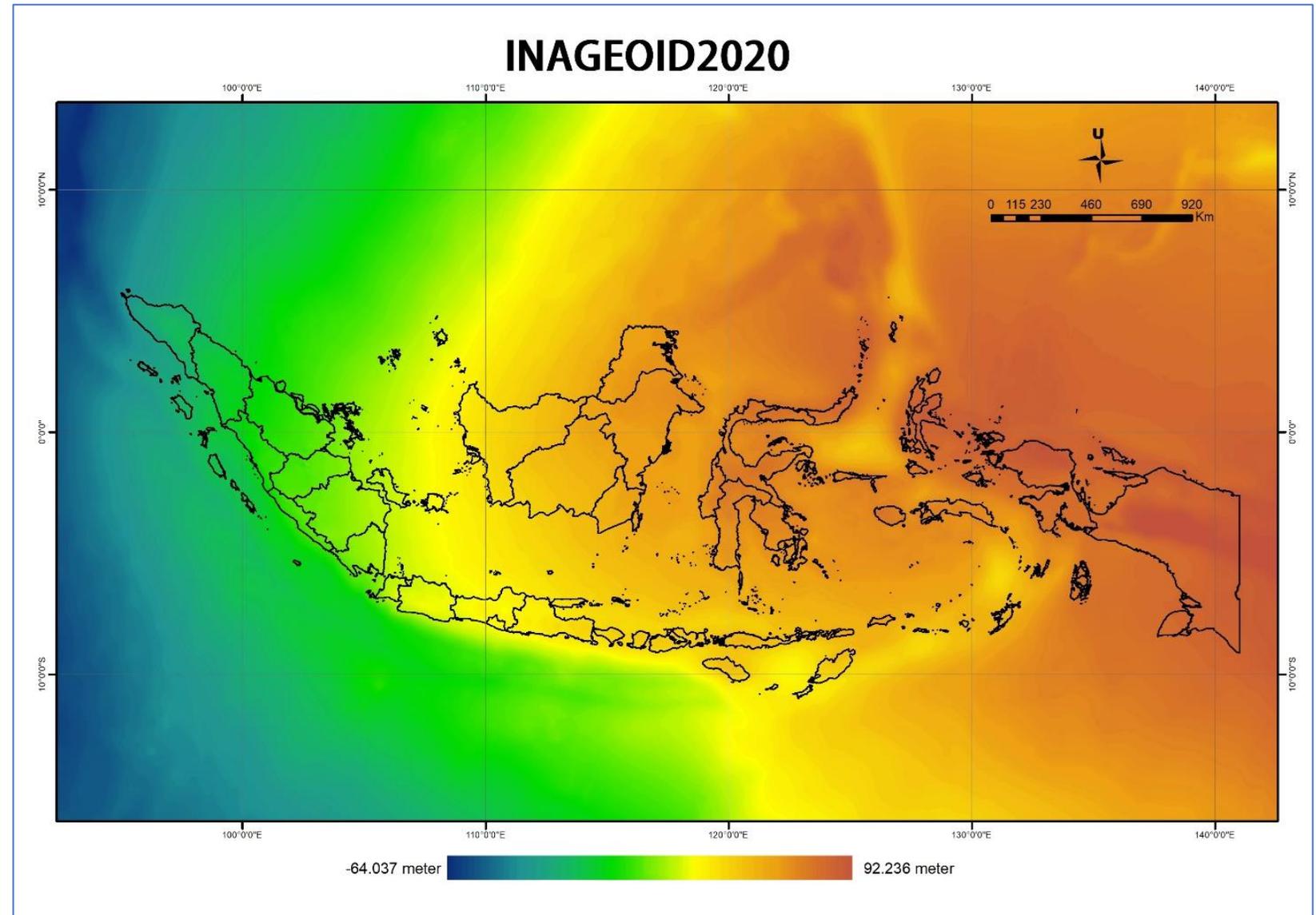


Indonesia Geoid 2020 (INAGEOID 2020)

- INAGEOID2020 as national vertical geospatial reference frame of Indonesia
- The use of INAGEOID2020 in Indonesia is mandatory.

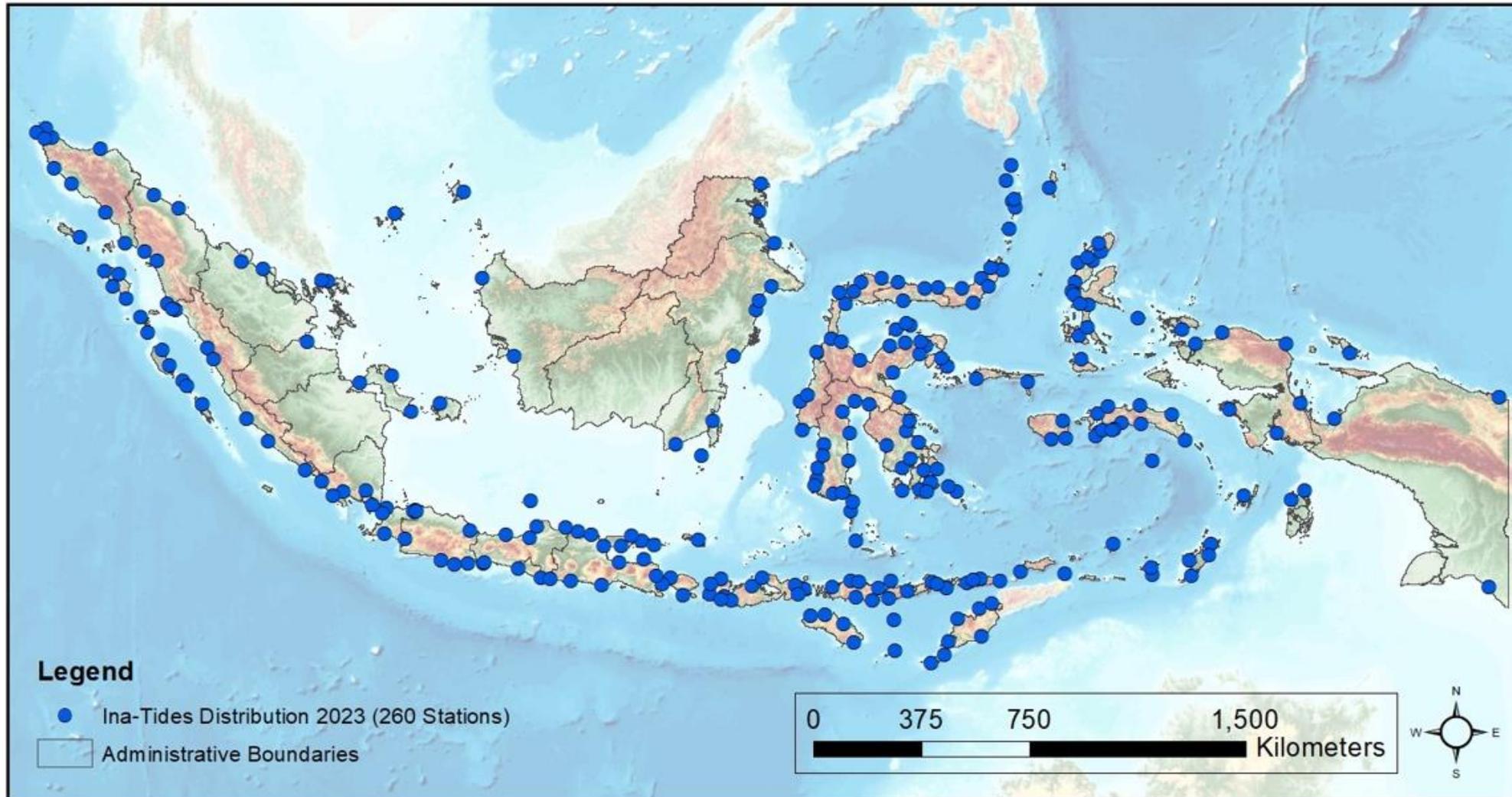
Spatial resolution:	0,01 x 0,01 degree
Unit:	Meter
Reference system:	SRGI2013
Gravity reference frame:	IGSN71 or its update including IGRS
Coverage:	The whole area of Indonesia

<https://srgi.big.go.id>





Indonesian Tides Station (Ina-Tides) Distribution

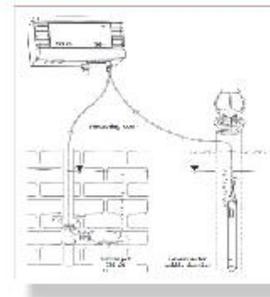
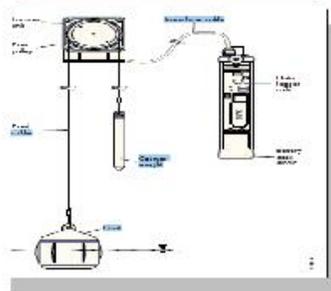


Ina-Tides System



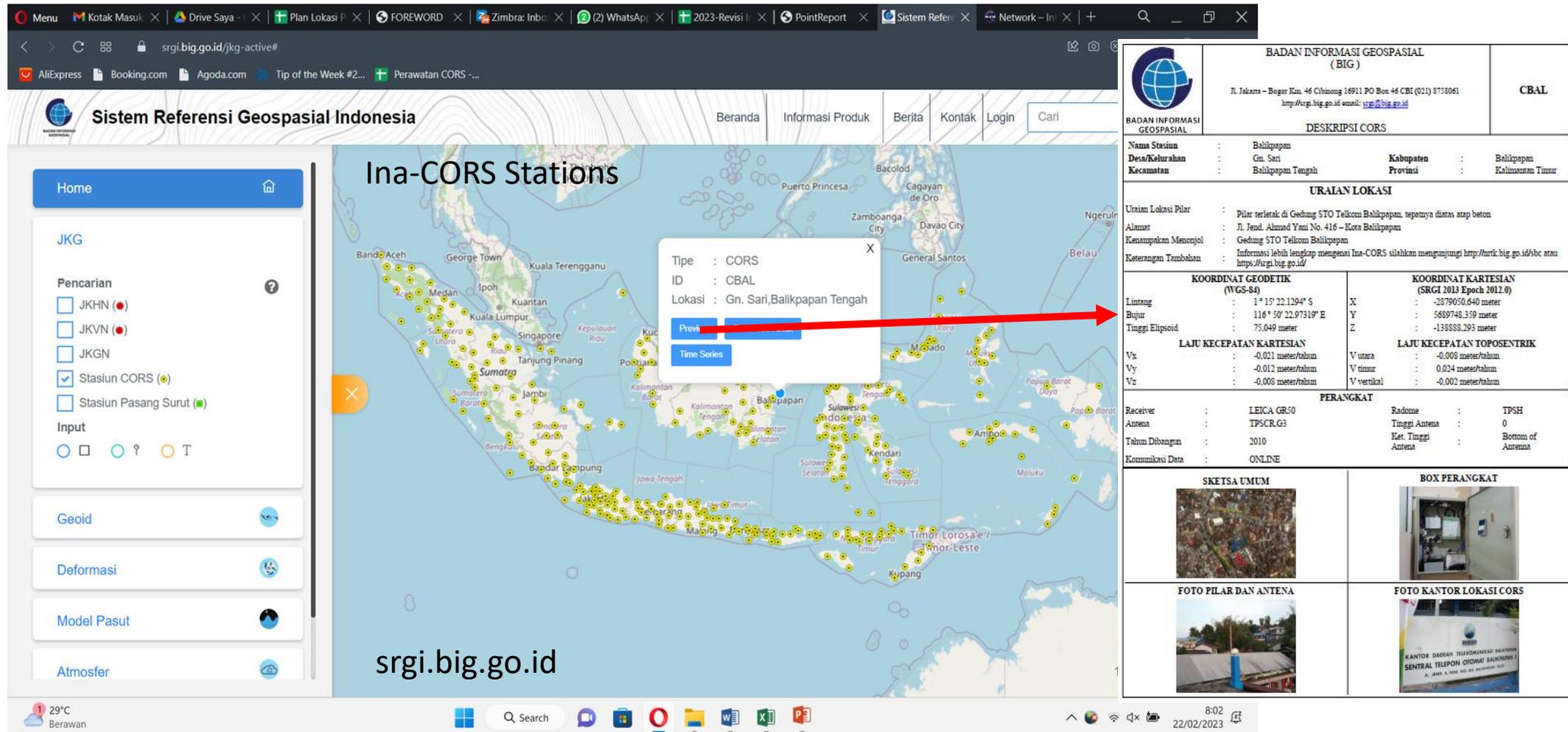
BIG-Tide Gauge System:

- Sensor 1 : Bubble Gauge
- Sensor 2 : Float Gauge
- Sensor 3 : Radar Gauge



IGRS Service and Access System

<https://srgi.big.go.id>



Sistem Referensi Geospasial Indonesia

Ina-CORS Stations

Geoid, Deformasi, Model Pasut, Atmosfer

29°C Berawan

22/02/2023

 BADAN INFORMASI GEOSPASIAL (BIG) Jl. Jakarta - Bogor Km. 46 Cibinong 16911 PO Box 46 CBI (021) 8778061 http://srgi.big.go.id email: srgi@big.go.id		CBAL
DESKRIPSI CORS Nama Stasiun : Balikpapan Desa/Kelurahan : Gn. Sari Kecamatan : Balikpapan Tengah Kabupaten : Balikpapan Provinsi : Kalimantan Timur		
URAIAN LOKASI Uraian Lokasi Pilar : Pilar terletak di Gedung STO Telkom Balikpapan, tepatnya diatas atap beton Alamat : Jl. Jend. Ahmad Yani No. 416 - Kota Balikpapan Kenampakan Menonjol : Gedung STO Telkom Balikpapan Keterangan Tambahan : Informasi lebih lengkap mengenai Ina-CORS silahkan mengunjungi http://turik.big.go.id/vbc atau https://srgi.big.go.id/		
KOORDINAT GEODETIK (WGS-84) Lintang : 1° 15' 22.1294" S Bujur : 116° 50' 22.97319" E Tinggi Elipsoid : 75.049 meter		KOORDINAT KARTESIAN (SRGI 2013 Epoch 2012.0) X : -2879050.640 meter Y : 5689748.359 meter Z : -138888.293 meter
LAJU KECEPATAN KARTESIAN Vx : -0.021 meter/tahun Vy : -0.012 meter/tahun Vz : -0.008 meter/tahun		LAJU KECEPATAN TOPOSENTRIK V utara : -0.008 meter/tahun V timur : 0.024 meter/tahun V vertikal : -0.002 meter/tahun
PERANGKAT Receiver : LEICA GR50 Antena : TPSCR.G3 Tahun Dibangun : 2010 Komunikasi Data : ONLINE Randome : TP5H Tinggi Antena : 0 Ket. Tinggi Antena : Bottom of Antenna		
SKETSA UMUM 		BOX PERANGKAT 
FOTO PILAR DAN ANTENA 		FOTO KANTOR LOKASI CORS 

IGRS Service and Access System

<https://srgi.big.go.id>

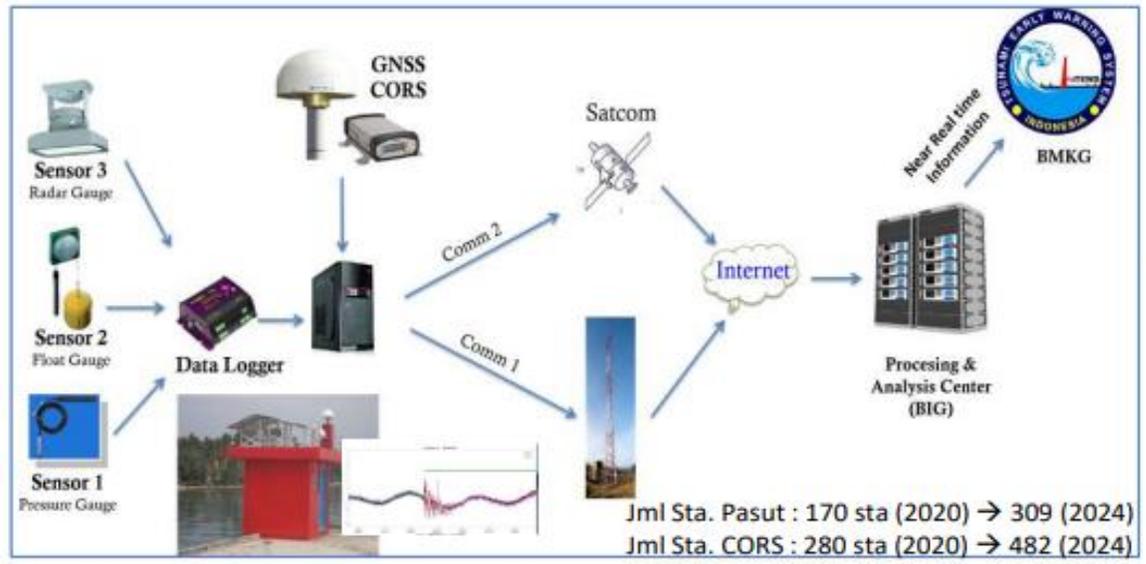
The screenshot displays the 'Sistem Referensi Geospasial Indonesia' (SRGI) web application. The main interface features a map of Southeast Asia with a geoid undulation overlay. A data popup window is open, showing the following information:

Latitude	-7.227882°
Longitude	108.408958°
Geoid Undulation (N)	23.178 m
Standard Deviation	0.118 m
Geodetic Height (h)	<input type="text" value="0"/>
Orthometric Height (H)	<small>Input the geodetic height</small>

The interface includes a navigation menu on the left with options like 'Home', 'JKG', 'Geoid', 'Layer', 'Input', 'Deformasi', 'Model Pasut', 'Atmosfer', and 'Transformasi'. The top navigation bar contains 'Beranda', 'Informasi Produk', 'Berita', 'Kontak', 'Login', and a search bar. The URL 'srgi.big.go.id' is visible at the bottom of the map area.

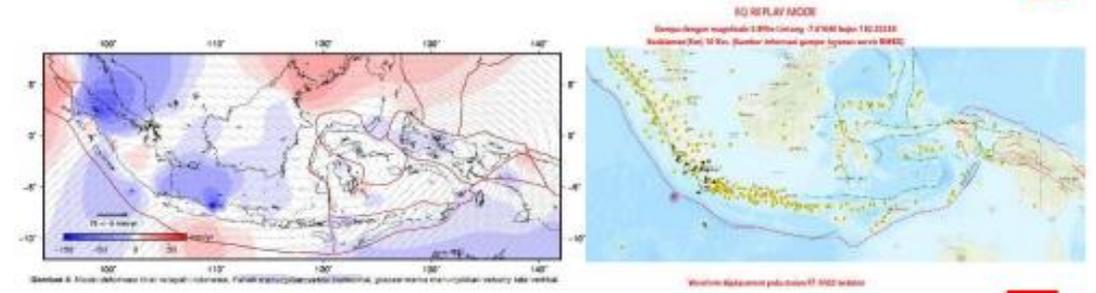
Other Use of Geodetic Infrastructure in Indonesia

Support on Indonesian Tsunami Early Warning System (InaTEWS)



- **Indonesian Tides System (Ina-Tides)** is a realtime and continuous sea level measurement at tide stations in Indonesia.
- **InaTides** support the information system of earthquake and tsunami early warning, on:
 - Detection of *rapid sea level changes* as a confirmation to tsunami early warning in the area when there is a tsunami.
 - A confirmation to end the tsunami early warning if the tsunami does not happen.

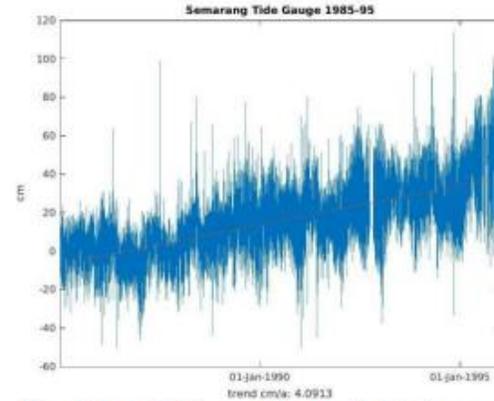
- **Indonesian Continuously Operating Reference Stations (Ina-CORS)** is a realtime and continuous positioning system at Geodetic Control Points in Indonesia.
- **InaCORS** support the information system of earthquake and tsunami early warning, on:
 - Detection of *displacement waveforms* when earthquake happen to provide additional data for earthquake parameters computation by BMKG.
 - Provide *information on tectonic plate movement* to study the earthquake potential area → *Strain Map & Stress Map*.



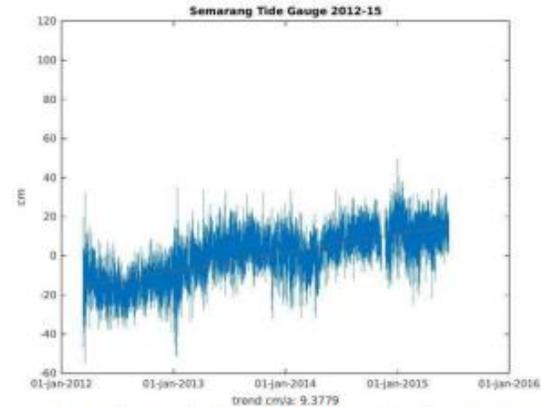
GNSS Controlled Tide Gauges For Sea Level Rise and Land Subsidence Monitoring



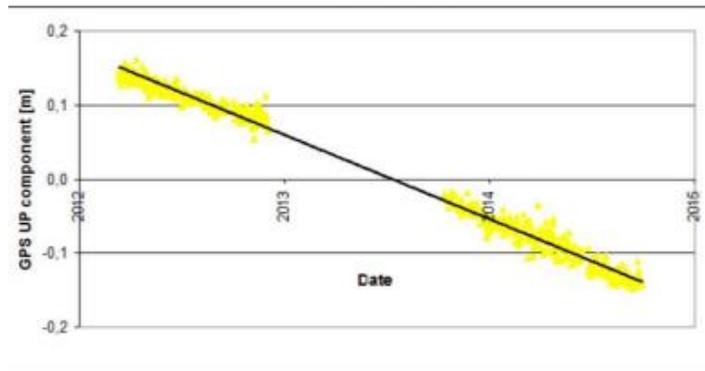
Case Study: SEMARANG



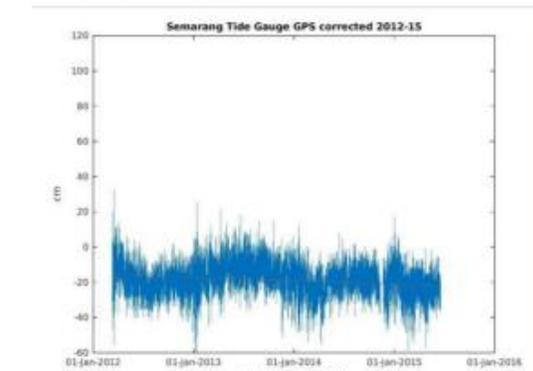
Sea Level Rise of 4 cm/yr between 1985-1995.



Sea Level Rise of 9 cm/yr between 2012-2015.



Land subsidence of 11 cm/yr (2015)



Corrected Sea Level Rise of 2 cm/yr

Concluding Remarks

1. The IGRS plays important roles in survey and mapping activities to implement One Map Policy in Indonesia.
2. The development of geodetic infrastructures will continue to cover most of Indonesian area.
3. Geodetic infrastructure in Indonesia is utilized in a wide range of applications, such as:
 - Surveying and Mapping
 - Earth System Monitoring
 - Indonesian Tsunami Early Warning System (Ina TEWS) o Land Subsidence Monitoring
 - Sea Level Rise Study

An aerial, stylized illustration of a university campus. The central focus is a courtyard with a large, dark blue building featuring a grid-like window pattern. Surrounding this central building are several other buildings in various shades of grey, blue, and red. The campus is interspersed with numerous green trees and shrubs. A road or path is visible at the top of the image, lined with a row of small trees. The overall style is clean and modern, with bold outlines and flat colors.

Thank you

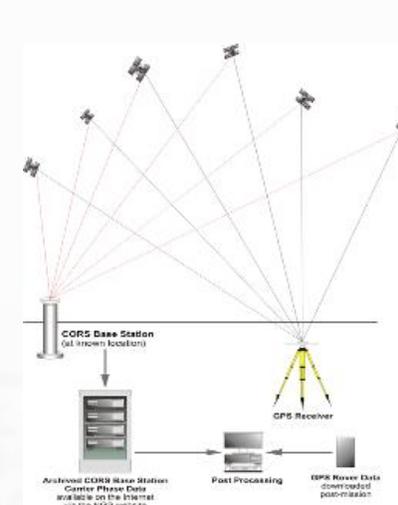
srgi.big.go.id

The IGRS is mainly used for:

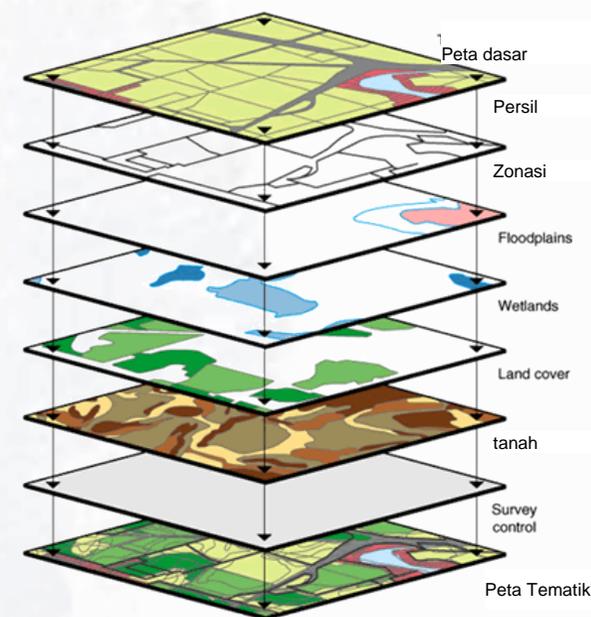
- (1) IGT wajib mengacu pada IGD.
- (2) Dalam hal terdapat IGD yang paling mutakhir, IGT wajib diselaraskan dengan IGD yang paling mutakhir.
- (3) Dalam hal IGD belum tersedia, penyelenggara IGT dapat membuat IGD untuk kepentingan sendiri dengan mengikuti standar dan spesifikasi teknis yang ditetapkan oleh Badan.
- (4) Pembuatan IGD dimaksud pada ayat (3) oleh penyelenggara IGT harus mendapat persetujuan Badan.
- (5) Salinan IGD yang dibuat oleh penyelenggara IGT wajib diserahkan ke Badan.
- (6) Badan dapat menyebarluaskan IGD sebagaimana dimaksud pada ayat (5) yang dibuat oleh penyelenggara IGT.

Yang dimaksud mengacu pada IGD adalah:

- Posisi IG wajib mengacu pada SRGI.
- Menggunakan peta dasar yang sama sebagai referensi geometris dalam pembuatan IGT.
- Peta dasar digunakan sebagai acuan dalam integrasi dan sinkronisasi IGT.
- Menggunakan peta dasar dengan skala yang sama atau lebih besar dari IGT yang akan dibuat.



Penentuan posisi IG wajib mengacu pada SRGI.



Peta dasar digunakan sebagai acuan dalam pembuatan IGT.