Semi-Dynamic Datum of Indonesia


Geospatial Information Agency, Indonesia (BIG)
Regional Tectonic of Indonesia

Intersection of 3 major plates, wide range of tectonic environments, including island arc volcanism, subduction zones, and arc-continent collision.
Seismicity of Indonesia Region

High seismicity, shallow EQs mostly confined at the subduction zone
Tectonic Complexity (Displacement)

Coordinates displacements

3D coordinate displacements due to motion of tectonic blocks

620 cm 3D coordinate displacements due to earthquakes

Coordinate displacements due to tectonic block motion since 1996, from GPS observations; courtesy of Meilano (ITB).
The Need for New Dynamic Datum

A new Geodetic Datum is required to accommodate the active tectonics of Indonesian region, and also to support One-Map Policy of the Indonesian government.

One Reference
One Standard
One Database
One GeoPortal

ONE-MAP POLICY
Geodetic Datum

1862 - 1970
- Local Topocentric Datum
- Static Datum
- Datum Genuk, Bukit Rimpah, Gunung Sahara, Serindung, Moncong Lowe, T21 Sorong

1970 - 1995
- ID 1974: National Topocentric Datum (Static Datum)
- Datum ID74

1996 - 2013
- National Geocentric Datum
- Static Datum
- Datum DGN95

2013 - ...
- National Geocentric Datum
- Semi-dynamic datum
- SRG12013 Deformation Model

Launched on October 11th 2013
IGRS 2013

Indonesia Geospatial Reference System 2013

HORIZONTAL

- Semi-Dynamic datum.
- Connected to the global ITRF2008 reference frame.
- Reference epoch: 1 January 2012
- Reference Ellipsoid: WGS 1984 ($a = 6378137.0$ m; $1/f = 298.257223563$).
- If a new version of the ITRF reference frame becomes available, then the IGRS reference frame will also be updated accordingly.
- A velocity model, which incorporates tectonic motion and earthquake related deformation, is used to transform coordinates at an observation epoch to or from this reference epoch.

VERTICAL

- Vertical datum is Geoid.
- The Geoid is derived from the gravity surveys which was tied to National Gravity Control Network (NGCN).
- NGCN has to be connected to the IGSN71 or its new version.
- In case there is no official Geoid yet, the vertical datum is MSL derived from 18.6 years tide observation or at least from 1 year observation.
Realization of IGRS2013

CGPS (134)
sGPS (1254)
Deformation Model

Data: cGPS and sGPS from 1993 - 2016

Deformation Model of IGRS2013

Secular Deformation Model
Coseismic Deformation Model
Vertical Reference System

Vertical Control Network

Gravity Control Network

Tide Gauge Stations
Geoid of Indonesia

- Borneo & Sulawesi Geoid derived by airborne gravity measurement conducted by DTU & BIG and need to be validated.
- Papua is still on processing.
- Other islands use MSL or EGM2008 as vertical datum.

Airborne Gravity Surveys of Java & Sumatra are set for 2018 budget (National Priority)
The rest of Indonesia will be conducted in 2019.
User services and system access

- Web based user services to give easiness accessing SRGI2013

- Type of services:
  - Explanation of SRGI2013;
  - Technical guide;
  - SRGI2013, covering horizontal and vertical datum and historical aspect as well;
  - Description of control station;
  - Real Time Kinematics service
  - Other facilities supporting SRGI2013 utilization.
User services and system access

RINEX data & RTK Service

Online Tide Gauge

Information of Geoid Undulation

Coordinate/epoch Transformation

Information of Control Station
Remarks

- A new semi-dynamic datum for Indonesia was launched in 2013 called Indonesia Geospatial Reference System 2013.
- 3 component of the IGRS2013 are horizontal geodetic datum, vertical datum, and user services and access.
- The horizontal deformation model was developed using GPS observation that consist secular deformation and coseismic deformation.
- More detail characteristics of the local deformation in Indonesian region is necessary for updating the velocity model of IGRS 2013.
- By the new definition of ITRF2014, the update of IGRS2014 will be initiated.
- Geoid as a vertical datum in Indonesia is under development.
- User services and system access still need to be improve.
Thank you