INDONESIAN GEOSPATIAL REFERENCE SYSTEM 2013 AND ITS IMPLEMENTATION ON POSITIONING

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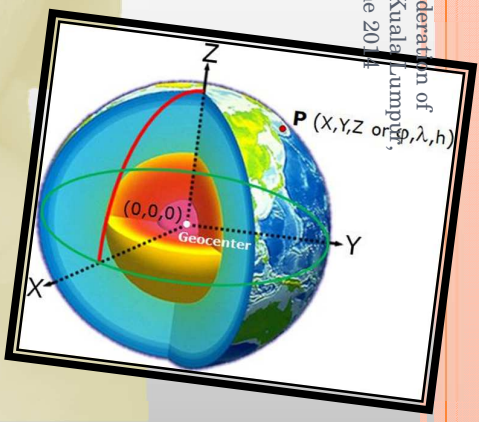
OUTLINE

- Introduction
- Ina-GRS 2013 / SRGI 2013 Components
- Implementation on positioning



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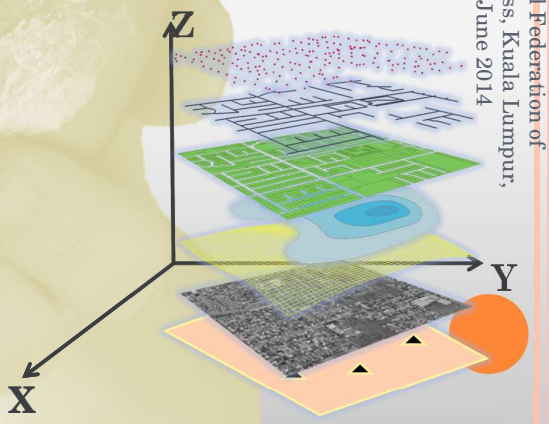
INTRODUCTION

- Single reference system has not been used consistently in every geospatial information enforcement by the various parties in Indonesia



INTRODUCTION

- Indonesia lays on subduction zone of 3 major tectonic plate that moves continuously ➔ Coordinate changes over time due to influence of tectonic plate movement and crustal deformation

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INTRODUCTION

- Positioning technology based on sattelite has possible to be used for accomplishment of national geodetic reference frame that compatible to global reference
- The old datum, DGN 1995, is the static datum and does not account coordinate change with time function ➔ It is should be enhanced due to plate tectonic movement, crustal deformation, and global reference system improvement.

INA-GRS/SRGI 2013 COMPONENTS

- Ina-GRS/SRGI 2013 consists of :
  - **Horizontal Geospatial Reference System,**
  - **Vertical Geospatial Reference System** and
  - **Access and Services System Of SRGI 2013**.

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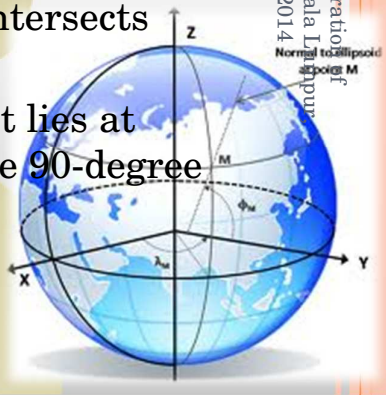
HORIZONTAL GEOSPATIAL REFERENCE SYSTEM (HGRS)

- used to definition or positioning in the horizontal position
  - Coordinate reference system
  - Coordinate reference frame
  - Geodetic datum
  - Coordinate change as a function time

COORDINATE REFERENCE SYSTEM

- Center point of axis coordinate coincides with center of earth, as defined by International Terestrial Reference System (*ITRS)*
- Unit lenght of axis coordinate using international standart units
- Orientation of axis coordinate is equatorial:
  - The z-axis coincides with the polar axis and is positive toward the north pole
  - The x-axis is in the equatorial plane and intersects the prime meridian (Greenwich)
  - The y-axis is also in the equatorial plane; it lies at right angles to the x-axis and intersects the 90-degree meridian



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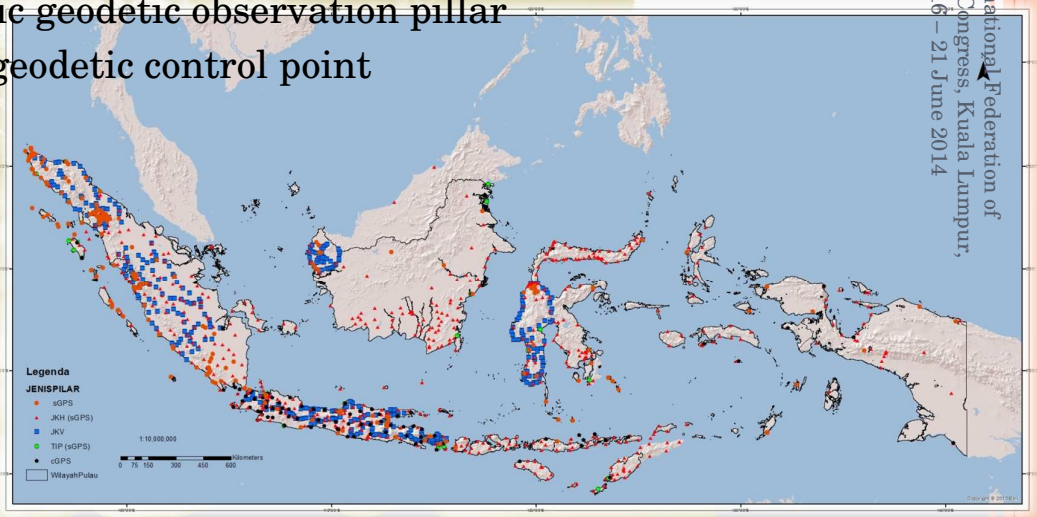
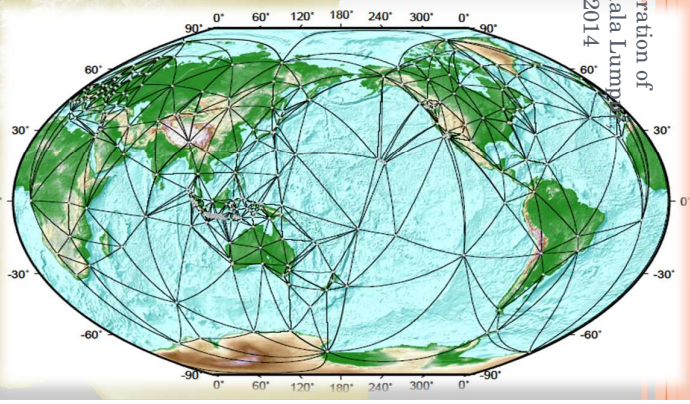
COORDINATE REFERENCE FRAME

- Coordinate reference frame is realization of coordinate reference system ➔ epoch 2012.0 or January, 1st 2012
- geodetic control network consists of:
  - continuous/permanent geodetic observation station
  - periodic geodetic observation pillar
  - other geodetic control point



COORDINATE REFERENCE FRAME

- for determine InaGRS 2013/SRGI 2013 ➔ combination between continuous/permanent geodetic observation station and periodic geodetic observation pillar that connected to global network.
- The number of stations and pillars are 954 local stations/pillars, as well as include 250 global network spread all over in the world



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GEODETIC DATUM

- Geodetic datum using World Geodetic System 1984 (WGS 1984) reference ellipsoid, where reference ellipsoid center point coincides with center of earth that used in ITRS

Parameter	Notation	Value
Semi major axis	a	6378137.0 meters
Semi minor axis	b	6356752.314245 meters
Inverse flattening	1/f	298.257223563
Angular velocity average of the earth's rotation axis	Ω	7292115×10^{-11} radian/sec
Earth gravvitational constant	GM	$3.986004418 \times 10^{14}$ $meter^3/sec^2$

COORDINATE CHANGE AS A FUNCTION TIME

- Coordinate change as a function time is a vector of coordinate values caused by the influence of tectonic plate movement and deformation of the earth's crust
- based on geodetic observations

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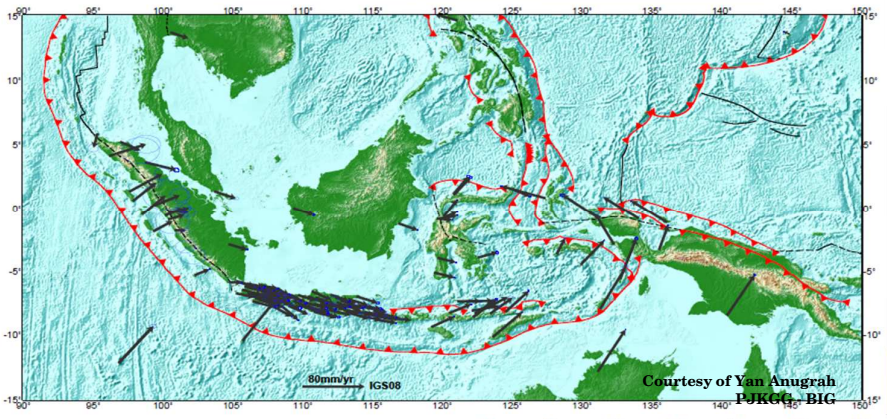
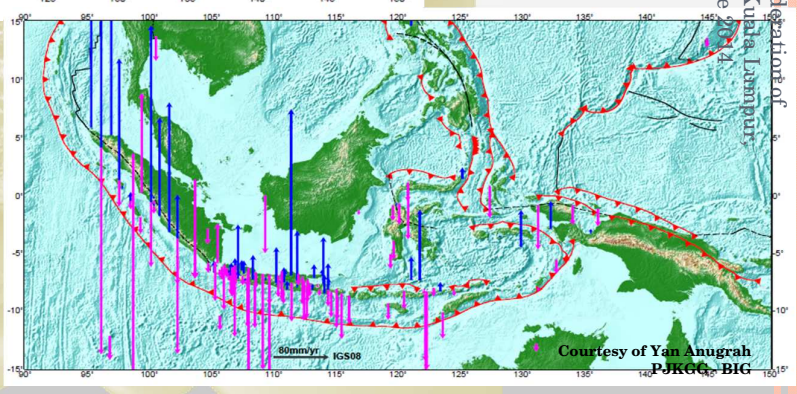
COORDINATE CHANGE AS A FUNCTION TIME





VERTICAL GEOSPATIAL REFERENCE SYSTEM (VGRS)

- coordinate reference system that used for height determination
- local high system based on Mean Sea Level (MSL) that currently used, possibilities inconsistent and difficult to establish in the nationwide height system unification.
- The solution of this problem is use the geoid as VGRS
- Now, Indonesian geoid model are covering Sulawesi and Borneo, by using airborne gravity measurement data. Test of geoid model accuracy in Sulawesi is 0.21 meters, while in Borneo is 0.36 meters.

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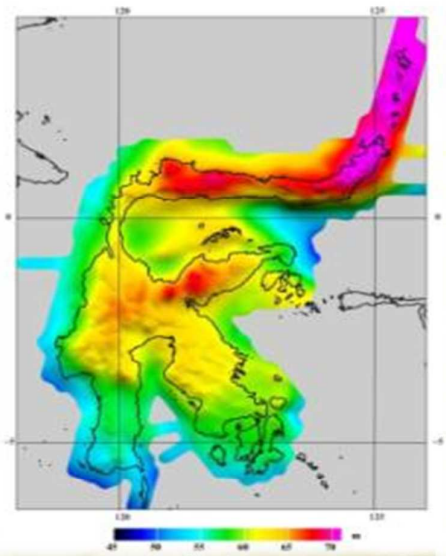
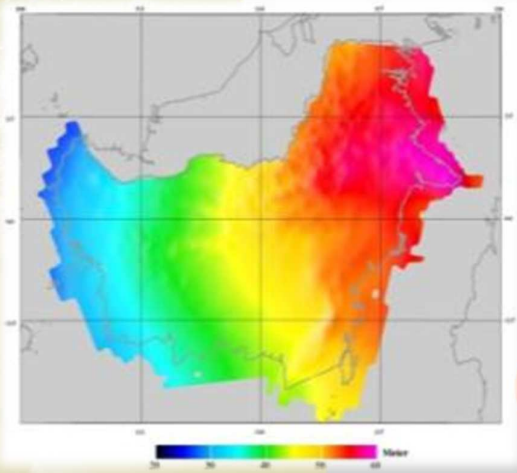
VERTICAL GEOSPATIAL REFERENCE SYSTEM (VGRS)



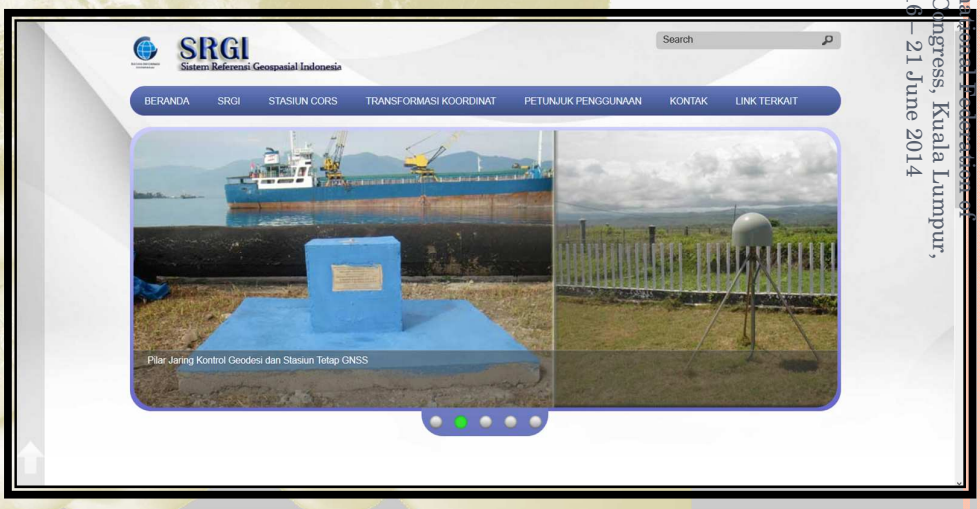
Sulawesi

Kalimantan / Borneo



ACCESS AND SERVICES SYSTEM OF SRGI 2013

- Access and system services of SRGI 2013 (as beta version) has established and can be accessed at website: http://www.srgi.big.go.id . It will be improved and updated continuously to give better service for users.



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Access and Services System Of SRGI 2013

- Updating SRGI 2013 is possible when force major is happened or there is global reference system improvement.
- When we updating SRGI 2013, we will label SRGI 2013 with name of updating year, followed by the epoch date.
- Example: SRGI 2013 (2017) Epoch 2016.35

DGN 1995 vs SRGI 2013

Information	DGN 1995	SRGI 2013
Reference system	Static	Coordinate change as a function time (Semi Dynamics)
Coordinate reference system	ITRS	ITRS
Coordinate reference frame	Geodetic Control network which is connected to ITRF 1992, epoch 1991.0	Geodetic Control network which is connected to ITRF 2008, epoch 2012.0
Geodetic Datum	WGS 84	WGS 84
Vertical reference system	MSL	Geoid
Accses and service system	closed	Online and self service

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IMPLEMENTASI ON POSITIONING

- DGN 95 ➔ SRGI 2013
- For navigation ➔ has no significant effect
- For positioning in stackingout applications ➔ If we have measured data in 2012 or earlier epoch, then by adding the model deformation and re-calculating the current epoch, then produce coordinates of the reference in the current epoch, and processing of stacking out.

IMPLEMENTASI ON POSITIONING

Source: Riqqi-2013

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IMPLEMENTASI ON POSITIONING

- For determination of a new point or accurate position as reference of geospatial information accomplishement ➔ In the picture if we take measurements at control point, then do calculation at the time of measurement epoch, to get the results on the epoch 2012.0 calculation by entering the model deformation and geoid models
- With SRGI 2013, which include change of coordinates as function of time, it is important to do the recording time measurement and measurement metadata completeness.

IMPLEMENTASI ON POSITIONING

Source: Riqqi-2013

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CONCLUSION

- With new national datum, SRGI 2013, the old national datum, DGN 1995, no longer used as a reference in the geospatial information accomplishment in Indonesia.
- SRGI 2013 has coordinate change as a function time and consists of horizontal and vertical geospatial reference system, and for user there are facilitate to access and services of SRGI 2013.
- Implementation in the positioning are for navigation is not too significant, for determination of new point or reference of geospatial information accomplishement, need to re-calculation at eoch 2012.0 by adding deformation model and geoid model. Meanwhile, for stackingout, after getting a reference coordinate at epoch 2012.0, needs re-calculation in the current epoch, then carried stacking out

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