



جابتن اوکور

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KEMENTERIAN PEMBANGUNAN
BRUNEI DARUSSALAM

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ISO 9001 E-mail : ukur@survey.gov.bn

THE EFFECT OF SABAH EARTHQUAKE ON BRUNEI CORS

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SURVEY DEPARTMENT
BRUNEI DARUSSALAM
SUPERVISOR : ABD. KHALIQ BIN BUJANG



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CONTENTS :

- INTRODUCTION
- BACKGROUND OF CORS
- METHODOLOGY
- GPS AND BERNESE SOFTWARE
- PROCESSING AND RESULT
- CONCLUSION

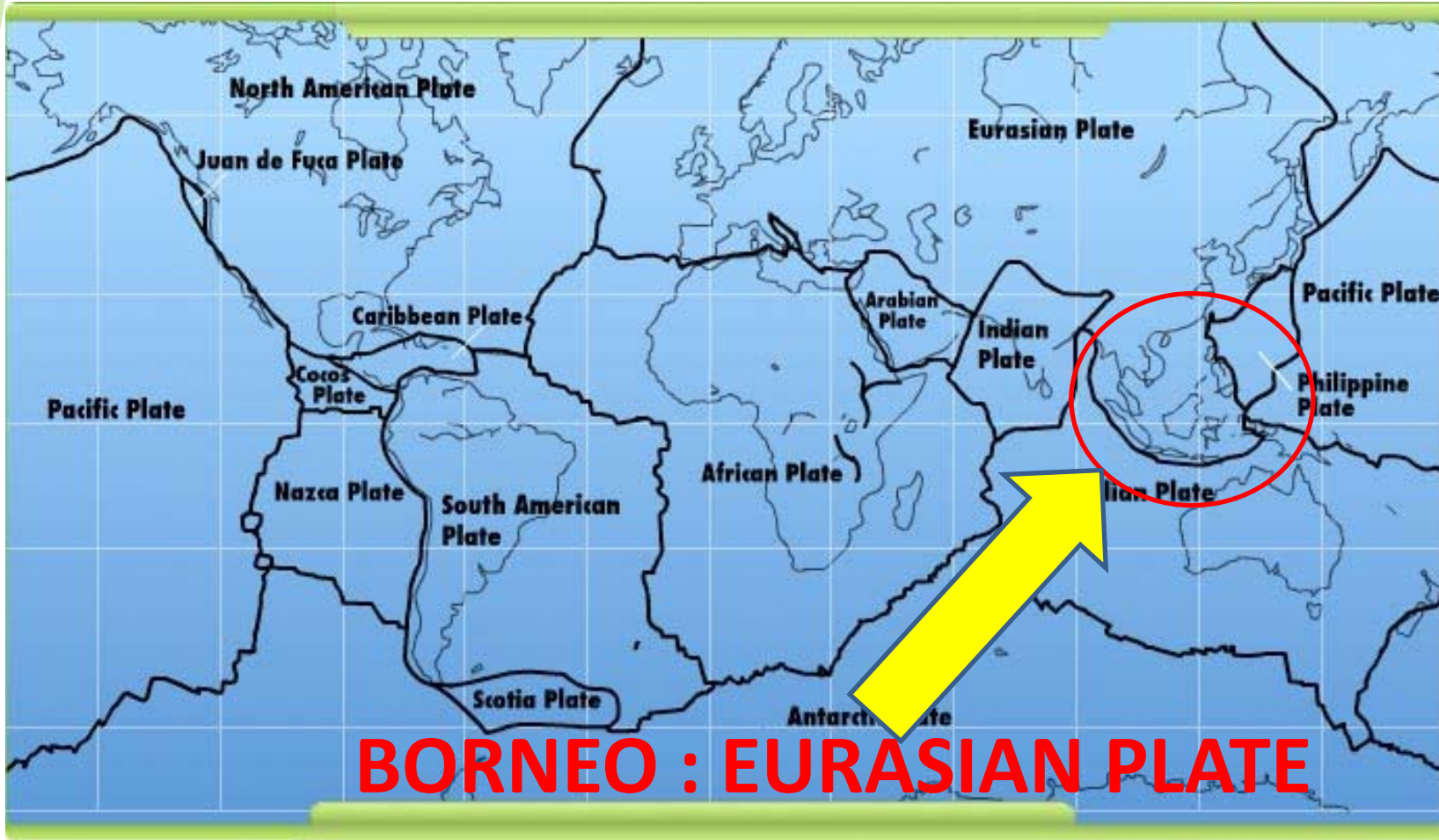


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INTRODUCTION



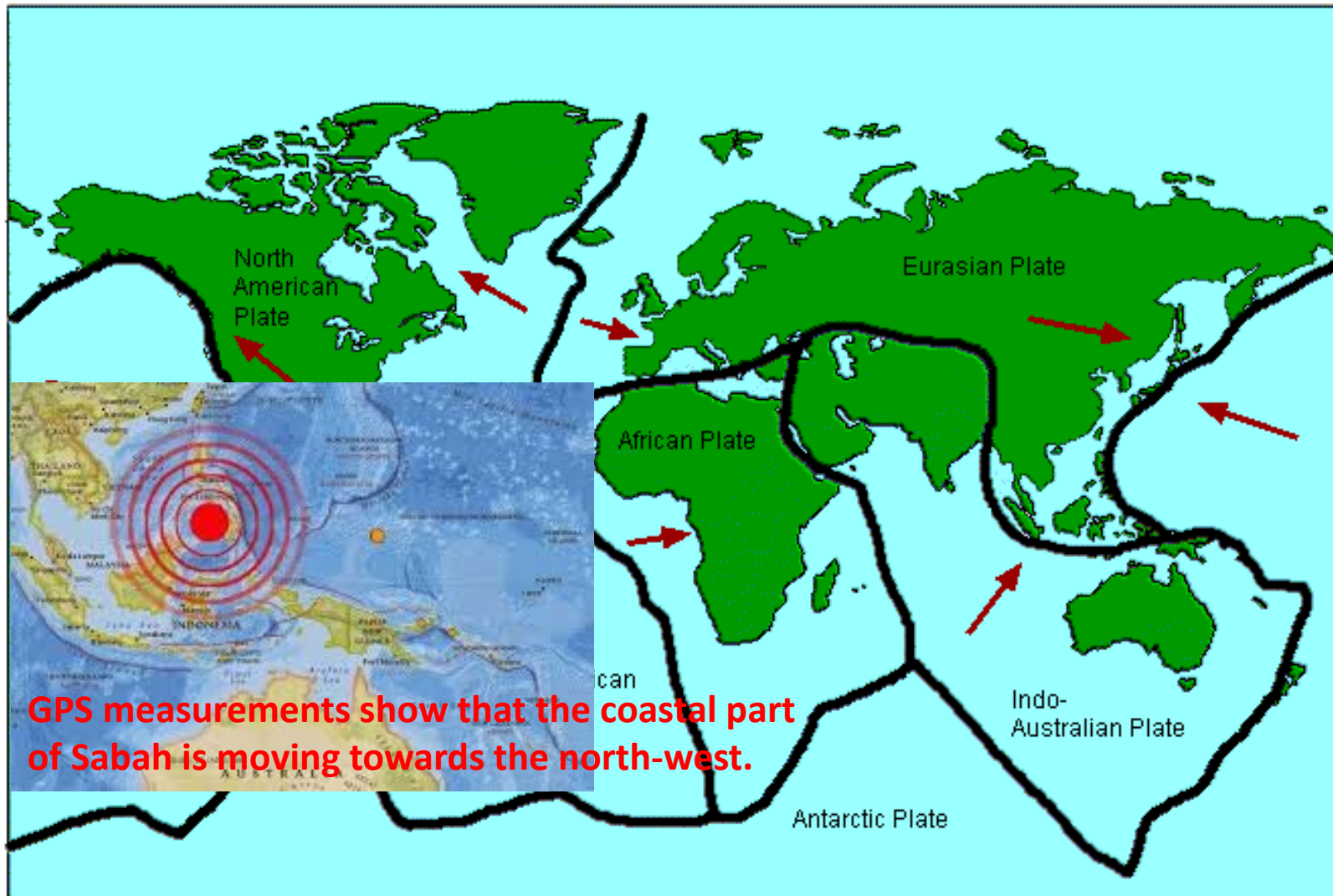


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SABAH EARTHQUAKE : 5 JUNE 2015 MAGNITUDE : 6.0 LASTED FOR 30 SECS

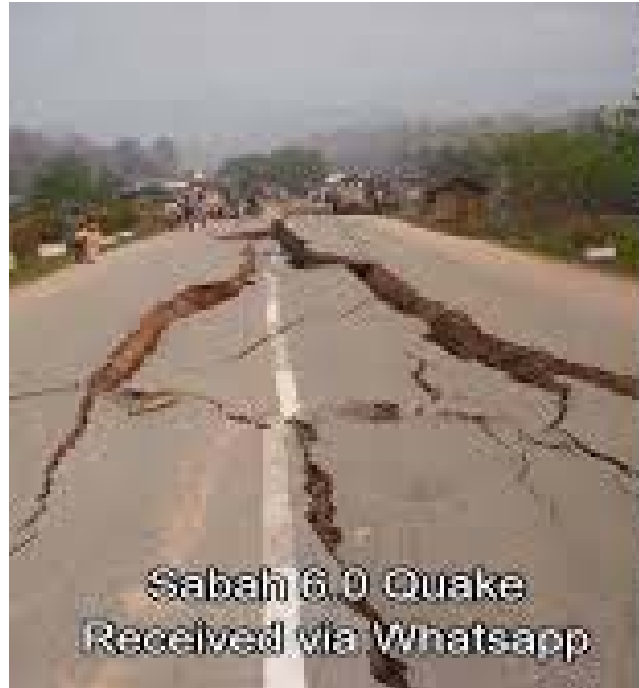




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Sabah 6.0 Quake
Received via Whatsapp



SABAH EARTHQUAKE

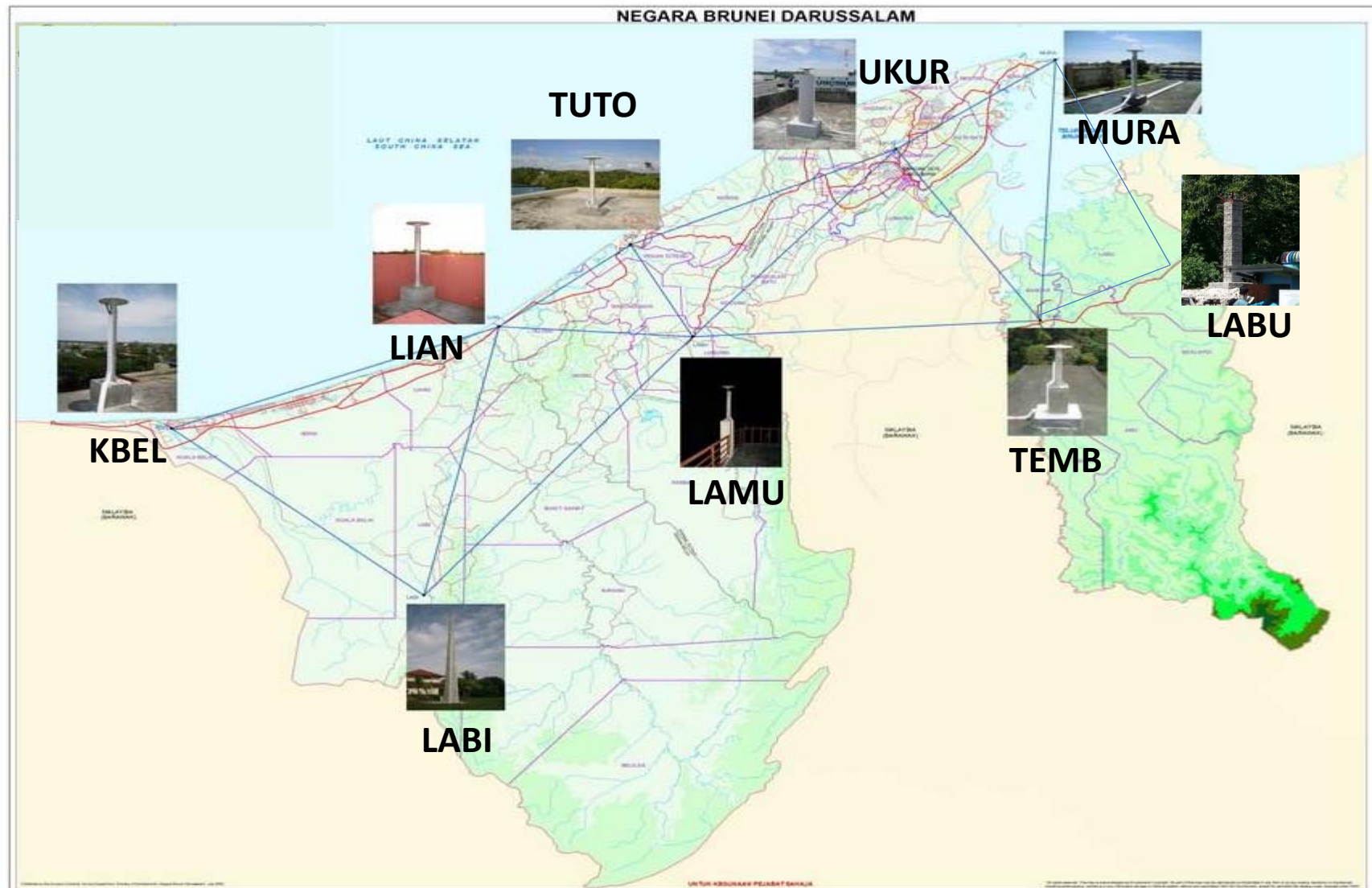


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BACKGROUND OF CONTINUOUSLY OPERATING REFERENCE STATIONS (CORS)





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AIMS OF THIS STUDY :

- WHAT TYPE OF DISPLACEMENT ??
- ANY DISPLACEMENT OCCURRED ON 5 JUN 2015 ??
- ARE COORDINATES STILL THE SAME ??



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TYPES OF DISPLACEMENTS :

5 DAYS DATA
BEFORE
EARTHQUAKE

- INTER SEISMIC

1 DAY DATA

- CO SEISMIC

GPS DATA
AFTER
EARTHQUAKE

- POST SEISMIC



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METHODOLOGY

- 3 chosen CORS were used to see whether there is any changes in coordinates and height
- For data processing, the local observation in Brunei needs to connect to IGS station for obtain high accuracy.
- Long baseline processing strategy is deployed to connect the local observation from Brunei to IGS station.
- Thus, the scientific software from Bernese version 5.0 is compatible for this task.

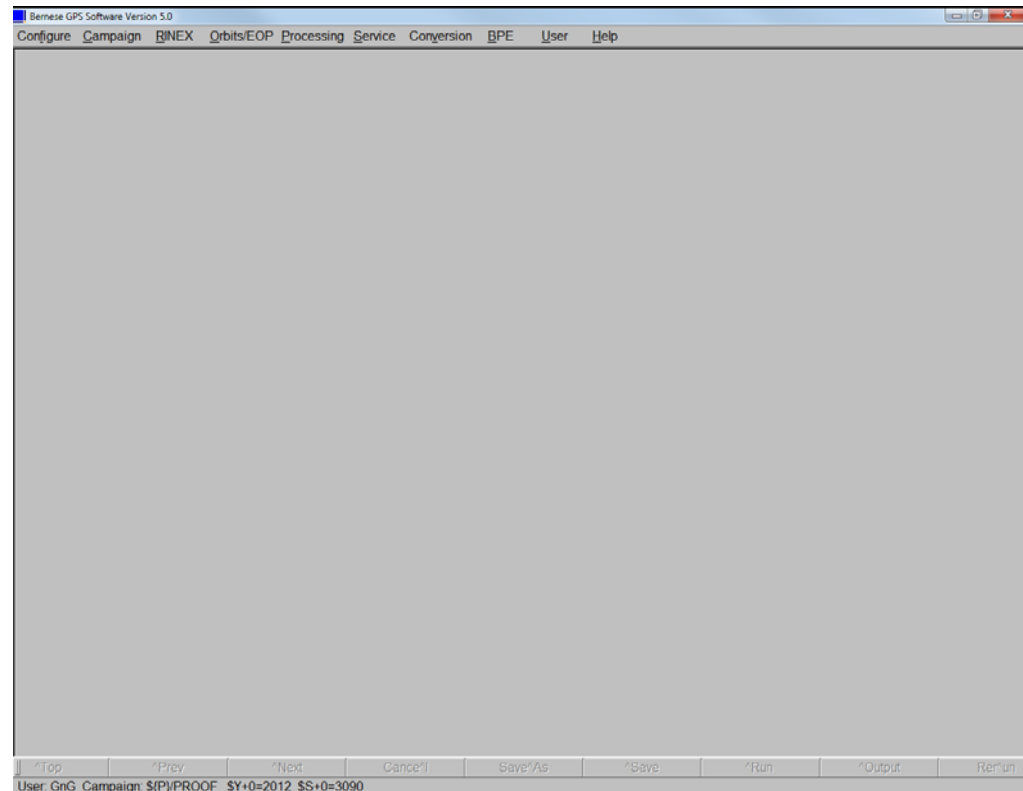


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- Bernese version 5.0 processing software developed by the Astronomical Institute University of Berne, Switzerland, was used by Brunei in the processing of Brunei Fundamental Layer stations.
- This software widely used for applications need high precision results.



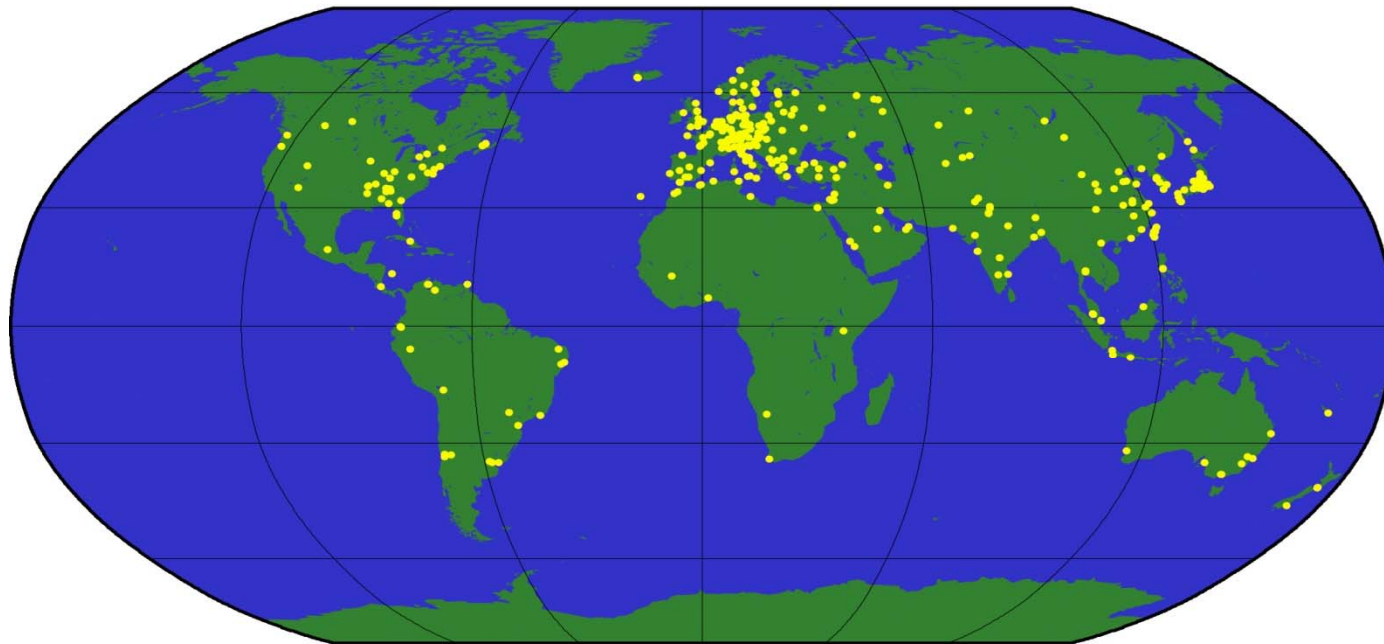


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Currently, nearly 600 institutions from all over the world are registered in the user database of the Bernese GNSS Software.





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HOW TO INSTALL BERNESE 5.0?

1. BSW50.exe

- Install the main programme tree

2. GPSUSER.exe

- Install the user environment

3. GPSDATA.exe

- Install the campaign structure and the Example campaign

4. ActivePerlScript.exe



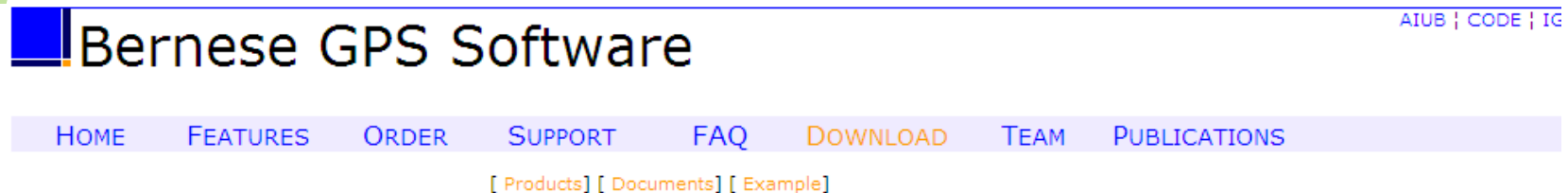
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UPDATE PROCEDURE

- Go to <http://www.bernese.unibe.ch/download>



Click here






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Index of ftp://ftp.unibe.ch/aiub/BSWUSER50/

 [Up to higher level directory](#)

Name	Size	Last Modified	
 .message	1 KB	9/29/2004	12:00:00 AM
 ATM		12/21/2009	1:47:00 PM
 GEN		5/13/2010	3:06:00 PM
 ORB		5/13/2010	3:06:00 PM
 STA		5/13/2010	3:07:00 PM
 TXT		5/29/2008	12:00:00 AM

Open / Click here
GEN folder



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It is recommended to update each listed file which is provided for Bernese user.

Critical file need to be concerned:

RECEIVER
SATELLITE
PHAS_COD.I01
PHAS_COD.I05
SAT2010.CRX

Index of ftp://ftp.unibe.ch/aiub/BSWUSER50/GEN/

Up to higher level directory

Name	Size	Last Modified
CONST.	3 KB	5/11/2010 4:37:00 PM
DATUM.	7 KB	5/11/2010 4:37:00 PM
EGM96.	5169 KB	9/29/2004 12:00:00 AM
GENT3.	53 KB	9/29/2004 12:00:00 AM
GPSUTC.	1 KB	5/11/2010 4:37:00 PM
I01.ATX	114 KB	4/29/2010 3:50:00 PM
I05.ATX	2430 KB	5/3/2010 11:07:00 AM
JGM3.	200 KB	9/29/2004 12:00:00 AM
PHAS_COD.I01	250 KB	5/13/2010 3:06:00 PM
PHAS_COD.I05	2834 KB	5/13/2010 3:06:00 PM
PHAS_IGS.REL	41 KB	10/7/2009 12:00:00 AM
RECEIVER.	10 KB	5/13/2010 3:06:00 PM
RECEIVER.OLD	6 KB	11/22/2007 12:00:00 AM
SATELLIT.	76 KB	5/13/2010 3:06:00 PM
SATELLIT.I01	77 KB	5/13/2010 3:06:00 PM
SATELLIT.I05	82 KB	5/13/2010 3:06:00 PM
SATELLIT.OLD	50 KB	11/17/2005 12:00:00 AM
SAT_1992.CRX	2 KB	2/24/2010 12:21:00 PM
SAT_1993.CRX	2 KB	2/24/2010 12:21:00 PM
SAT_1994.CRX	6 KB	2/24/2010 12:21:00 PM
SAT_1995.CRX	10 KB	2/24/2010 12:21:00 PM
SAT_1996.CRX	21 KB	2/24/2010 12:21:00 PM
SAT_1997.CRX	44 KB	2/24/2010 12:21:00 PM
SAT_1998.CRX	69 KB	2/24/2010 12:21:00 PM
SAT_1999.CRX	88 KB	2/24/2010 12:21:00 PM
SAT_2000.CRX	84 KB	2/24/2010 12:21:00 PM
SAT_2001.CRX	106 KB	2/24/2010 12:21:00 PM
SAT_2002.CRX	51 KB	2/24/2010 12:21:00 PM
SAT_2003.CRX	54 KB	2/24/2010 12:21:00 PM
SAT_2004.CRX	39 KB	2/24/2010 12:21:00 PM
SAT_2005.CRX	30 KB	2/24/2010 12:21:00 PM
SAT_2006.CRX	36 KB	2/24/2010 12:21:00 PM
SAT_2007.CRX	43 KB	2/24/2010 12:21:00 PM
SAT_2008.CRX	23 KB	2/24/2010 12:21:00 PM
SAT_2009.CRX	42 KB	2/24/2010 12:21:00 PM
SAT_2010.CRX	20 KB	5/13/2010 3:06:00 PM



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Example :

- PHAS_COD.I01
- PHAS_COD.I05
- PHAS_IGS.REL
- RECEIVER.
- RECEIVER.OLD
- SATELLIT.
- SATELLIT.I01
- SATELLIT.I05
- SATELLIT.OLD
- SAT_1992.CRX

Open PHAS_COD.I01.

250 KB	5/13/2010	3:06:00 PM
2834 KB	5/13/2010	3:06:00 PM
41 KB	10/7/2009	12:00:00 AM
10 KB	5/13/2010	3:06:00 PM
6 KB	11/22/2007	12:00:00 AM
76 KB	5/13/2010	3:06:00 PM
77 KB	5/13/2010	3:06:00 PM
82 KB	5/13/2010	3:06:00 PM
50 KB	11/17/2005	12:00:00 AM
2 KB	2/24/2010	12:21:00 PM

```

MODEL NAME: 1GJ_01
I01.ATX
ANTENNA TYPE ANTENNA S/N FRQM PHASE CENTER OFFSETS (M) ZENITH DEPENDENCE OF PHASE CENTER (NM)
FROM TO L+ NORTH EAST UP PMT 00 05 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
***** 4 * * * * * 4 * * * * * 4 * * * * * 4 * * * * * 4 * * * * * 4 * * * * * 4 * * * * * 4 * * * * * 4 * * * * * 4 * * * * *
MW TRANSM I 001 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 002 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 003 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 004 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 005 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 006 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 008 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 009 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 010 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000
MW TRANSM I 011 0 999999 1 0.0000 0.0000 0.0000 2 0.0000 0.0000 0.0000
2 0.0000 0.0000 0.0000

```

SELECT ALL, COPY AND PASTE IN NOTEPAD.
SAVE NOTEPAD AS PHAS_COD.I01.
SAVE IN C:\BERN50\GPS\GEN
DIRECTORY .

P/s:same procedure for the other files.



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Basically, three (3) major steps in Bernese data processing:





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1. DATA PREPARATION:

- 1 DAY DATA ON UKUR, MURA AND LABU
- DATED 5 JUNE 2015

GPS WEEK	YEAR	DAY OF YEAR	YEAR MONTH DAY
18475	2015	156	2015 06 05

- GPS CALENDAR

[HTTPS :// WWW.NGS.NOAA.GOV/CORS/GPSCAL](https://www.ngs.noaa.gov/cors/gpscald)



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Bundesamt für
Kartographie und Geodäsie

GPS Calendar 2015

January				February				March				April				May				June			
Gregor. Date	Day Number	Week / Day	Modif. Julian Day	Gregor. Date	Day Number	Week / Day	Modif. Julian Day	Gregor. Date	Day Number	Week / Day	Modif. Julian Day	Gregor. Date	Day Number	Week / Day	Modif. Julian Day	Gregor. Date	Day Number	Week / Day	Modif. Julian Day	Gregor. Date	Day Number	Week / Day	Modif. Julian Day
1 Thu	1	1825 4	57 023	1 Sun	32	1830 0	57 054	1 Sun	60	1834 0	57 082	1 Wed	91	3	113	1 Fri	121	5	143	1 Mon	152	1	174
2 Fri	2	5	024	2 Mon	33	1	055	2 Mon	61	1	083	2 Thu	92	4	114	2 Sat	122	6	144	2 Tue	153	2	175
3 Sat	3	6	025	3 Tue	34	2	056	3 Tue	62	2	084	3 Fri	93	5	115	3 Sun	123	1843 0	57 145	3 Wed	154	3	176
4 Sun	4	1826 0	57 026	4 Wed	35	3	057	4 Wed	63	3	085	4 Sat	94	6	116	4 Mon	124	1	146	4 Thu	155	4	177
5 Mon	5	1	027	5 Thu	36	4	058	5 Thu	64	4	086	5 Sun	95	1839 0	57 117	5 Tue	125	2	147	5 Fri	156	5	178
6 Tue	6	2	028	6 Fri	37	5	059	6 Fri	65	5	087	6 Mon	96	1	118	6 Wed	126	3	148	6 Sat	157	6	179
7 Wed	7	3	029	7 Sat	38	6	060	7 Sat	66	6	088	7 Tue	97	2	119	7 Thu	127	4	149	7 Sun	158	1848 0	57 180
8 Thu	8	4	030	8 Sun	39	1831 0	57 061	8 Sun	67	1835 0	57 089	8 Wed	98	3	120	8 Fri	128	5	150	8 Mon	159	1	181
9 Fri	9	5	031	9 Mon	40	1	062	9 Mon	68	1	090	9 Thu	99	4	121	9 Sat	129	6	151	9 Tue	160	2	182
10 Sat	10	6	032	10 Tue	41	2	063	10 Tue	69	2	091	10 Fri	100	5	122	10 Sun	130	1844 0	57 152	10 Wed	161	3	183
11 Sun	11	1827 0	57 033	11 Wed	42	3	064	11 Wed	70	3	092	11 Sat	101	6	123	11 Mon	131	1	153	11 Thu	162	4	184
12 Mon	12	1	034	12 Thu	43	4	065	12 Thu	71	4	093	12 Sun	102	1840 0	57 124	12 Tue	132	2	154	12 Fri	163	5	185
13 Tue	13	2	035	13 Fri	44	5	066	13 Fri	72	5	094	13 Mon	103	1	125	13 Wed	133	3	155	13 Sat	164	6	186
14 Wed	14	3	036	14 Sat	45	6	067	14 Sat	73	6	095	14 Thu	104	2	126	14 Thu	134	4	156	14 Sun	165	1849 0	57 187
15 Thu	15	4	037	15 Sun	46	1832 0	57 068	15 Sun	74	1836 0	096	15 Wed	105	3	127	15 Fri	135	5	157	15 Mon	166	1	188
16 Fri	16	5	038	16 Mon	47	1	069	16 Mon	75	1	097	16 Thu	106	4	128	16 Sat	136	6	158	16 Tue	167	2	189
17 Sat	17	6	039	17 Tue	48	2	070	17 Tue	76	2	098	17 Fri	107	5	129	17 Sun	137	1845 0	57 159	17 Wed	168	3	190
18 Sun	18	1828 0	57 040	18 Wed	49	3	071	18 Wed	77	3	099	18 Sat	108	6	130	18 Mon	138	1	160	18 Thu	169	4	191
19 Mon	19	1	041	19 Thu	50	4	072	19 Thu	78	4	100	19 Sun	109	1841 0	57 131	19 Tue	139	2	161	19 Fri	170	5	192
20 Tue	20	2	042	20 Fri	51	5	073	20 Fri	79	5	101	20 Mon	110	1	132	20 Wed	140	3	162	20 Sat	171	6	193
21 Wed	21	3	043	21 Sat	52	6	074	21 Sat	80	6	102	21 Tue	111	2	133	21 Thu	141	4	163	21 Sun	172	1850 0	57 194
22 Thu	22	4	044	22 Sun	53	1833 0	57 075	22 Sun	81	1837 0	57 103	22 Wed	112	3	134	22 Fri	142	5	164	22 Mon	173	1	195
23 Fri	23	5	045	23 Mon	54	1	076	23 Mon	82	1	104	23 Thu	113	4	135	23 Sat	143	6	165	23 Tue	174	2	196
24 Sat	24	6	046	24 Tue	55	2	077	24 Tue	83	2	105	24 Fri	114	5	136	24 Sun	144	1846 0	57 166	24 Wed	175	3	197
25 Sun	25	1829 0	57 047	25 Wed	56	3	078	25 Wed	84	3	106	25 Sat	115	6	137	25 Mon	145	1	167	25 Thu	176	4	198
26 Mon	26	1	048	26 Thu	57	4	079	26 Thu	85	4	107	26 Sun	116	1842 0	57 138	26 Tue	146	2	168	26 Fri	177	5	199
27 Tue	27	2	049	27 Fri	58	5	080	27 Fri	86	5	108	27 Mon	117	1	139	27 Wed	147	3	169	27 Sat	178	6	200
28 Wed	28	3	050	28 Sat	59	6	081	28 Sat	87	6	109	28 Tue	118	2	140	28 Thu	148	4	170	28 Sun	179	1851 0	57 201
29 Thu	29	4	051					29 Sun	88	1838 0	57 110	29 Wed	119	3	141	29 Fri	149	5	171	29 Mon	180	1	202
30 Fri	30	5	052					30 Mon	89	1	111	30 Thu	120	4	142	30 Sat	150	6	172	30 Tue	181	2	203
31 Sat	31	6	053					31 Tue	90	2	112					31 Sun	151	1847 0	57 173				

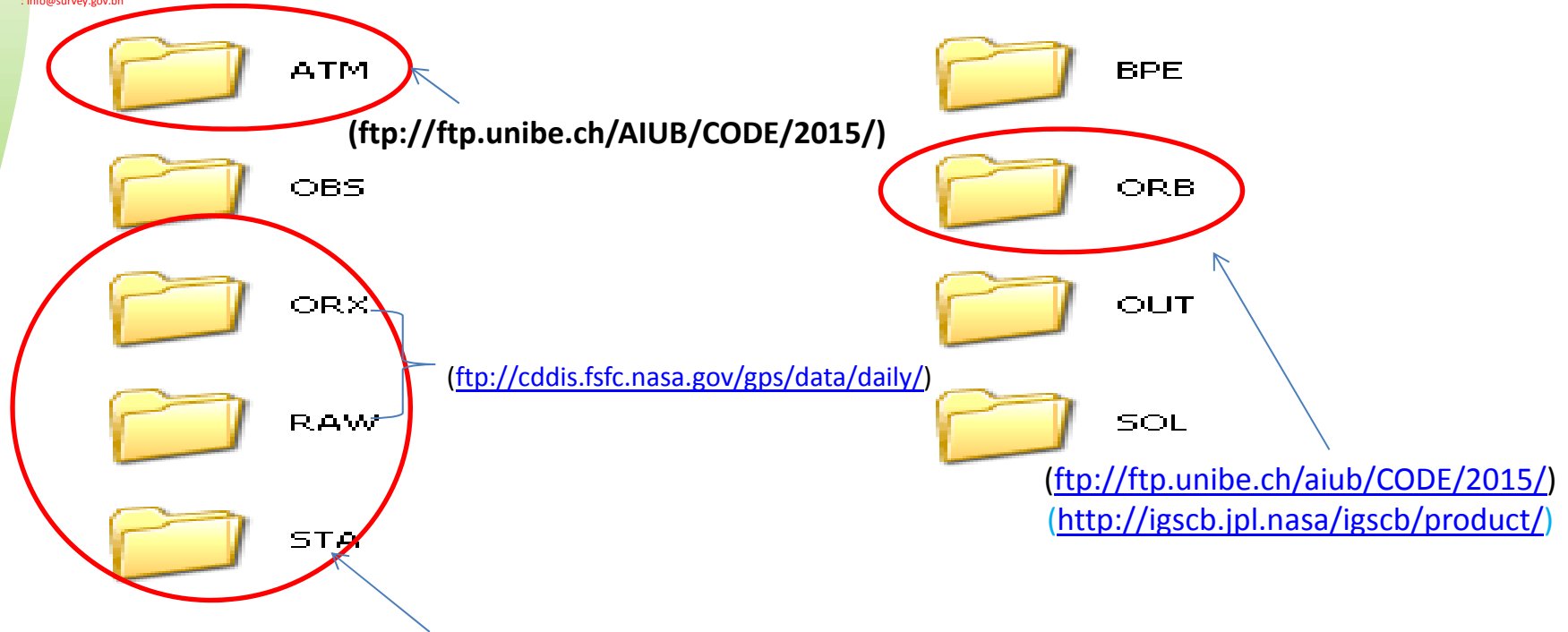


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PREPARATION OF DATA :



STA <ftp://ftp.unibe.ch.ch/aiub/BSWUSER50/STA/>
BLQ <http://holt.oso.chalmers.se/loading/>



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ATM



ORB

- ATM(ATMOSPHERE) FILES ARE GLOBAL IONOSPHERE MODELS IN THE BERNESE FORMAT OBTAINED FROM THE IGS PROCESSING CODE.
- IT WILL BE USED TO RESOLVE THE PHASE AMBIGUITIES USING THE QIF-STRATEGY (QUASI IONOSPHERE FREE)
- COD1875.ION
- ✓ ORB IS THE LOCATION OF ORBIT RELATED FILES SUCH AS DCB (DIFFERENTIAL CODE BIASES),.EPH ,.SP3 AND.ERP.
- ✓ THESE FILES ARE CONVERTED TO EXTENSION .PRE (IGS PRECISE ORBIT), .IEP (EARTH ORIENTATION PARAMETERS)



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ORX



RAW



STA

ORX – ORIGINAL RINEX FILE

RAW-RINEX FILES READY TO IMPORT INTO THE PROCESSING

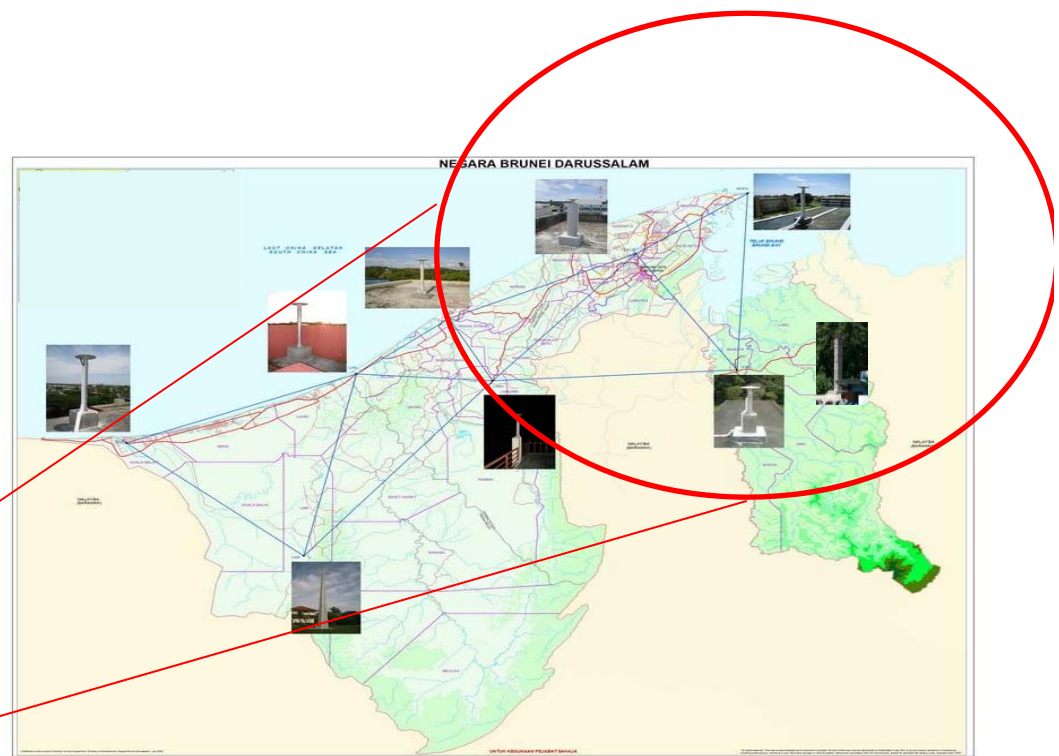
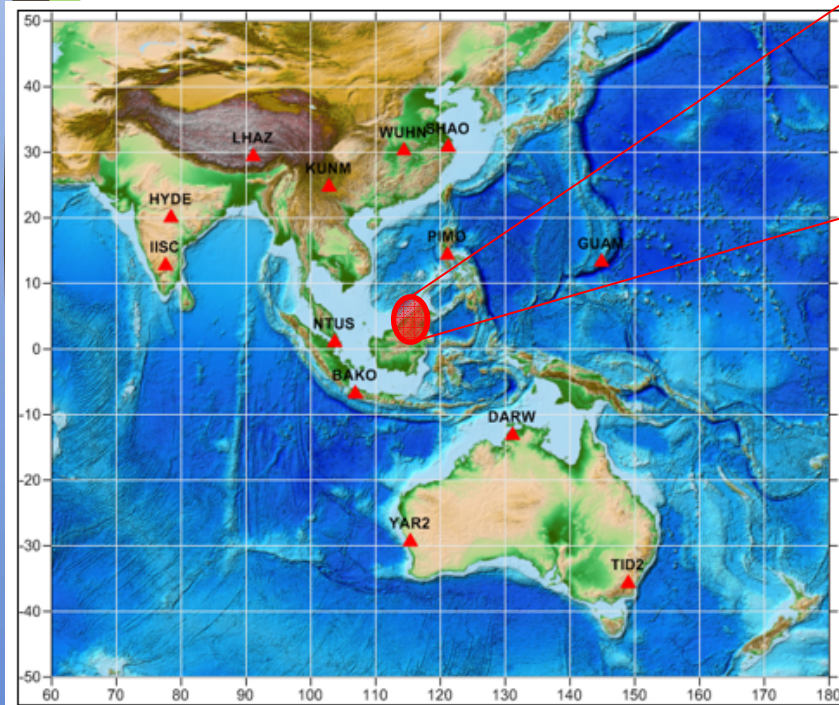
STA –CAMPAIGN SPECIFIC STATION FILES.



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- Availability of IGS station within South East and Australia region.



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CAMPAIGN SET UP

The screenshot displays the Bernese GPS Software Version 5.0 interface. The main window has a blue background. The menu bar includes: Configure, Campaign, RINEX, Orbits/EOP, Processing, Service, Conversion, BPE, User, and Help. The 'Campaign' menu is open, showing the following options: Select active campaign, Edit list of campaigns, Create new campaign (highlighted), Edit session table, and Edit station files. The status bar at the bottom of the window shows: User: user Campaign: \${P}/SATURDAY \$Y+0=2010 \$S+0=1200. The Windows taskbar at the bottom shows the Start button and several open applications: Bernese GPS Softwar..., GPSDATA, and BERNESE_VIDEO.



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Bernese GPS Software Version 5.0

Configure Campaign RINEX Orbits/EOP Processing Service Conversion BPE User Help

CREATE NEW CAMPAIGN DIRECTORIES

Selected campaign \${P}/SATURDAY

Subdirectories	Files	Source directory
ATM <input type="checkbox"/> - <input type="checkbox"/> +	STA/SESSIONS.SES <input type="checkbox"/> - <input type="checkbox"/> +	<input type="text" value="\${X}/SKL"/> ▾
BPE <input type="checkbox"/> - <input type="checkbox"/> +		
OBS <input type="checkbox"/> - <input type="checkbox"/> +		
ORB <input type="checkbox"/> - <input type="checkbox"/> +		
ORX <input type="checkbox"/> - <input type="checkbox"/> +		
OUT <input type="checkbox"/> - <input type="checkbox"/> +		
RAW <input type="checkbox"/> - <input type="checkbox"/> +		
SOL <input type="checkbox"/> - <input type="checkbox"/> +		
STA <input type="checkbox"/> - <input type="checkbox"/> +		

User: user Campaign: \${P}/SATURDAY \$Y+0=2010 \$S+0=1200 File: c:\GPSUSER/PANNEWWCAMP.INP

start | Bernese GPS Softwar... | GP5DATA | BERNESE_VIDEO | 8:23 PM

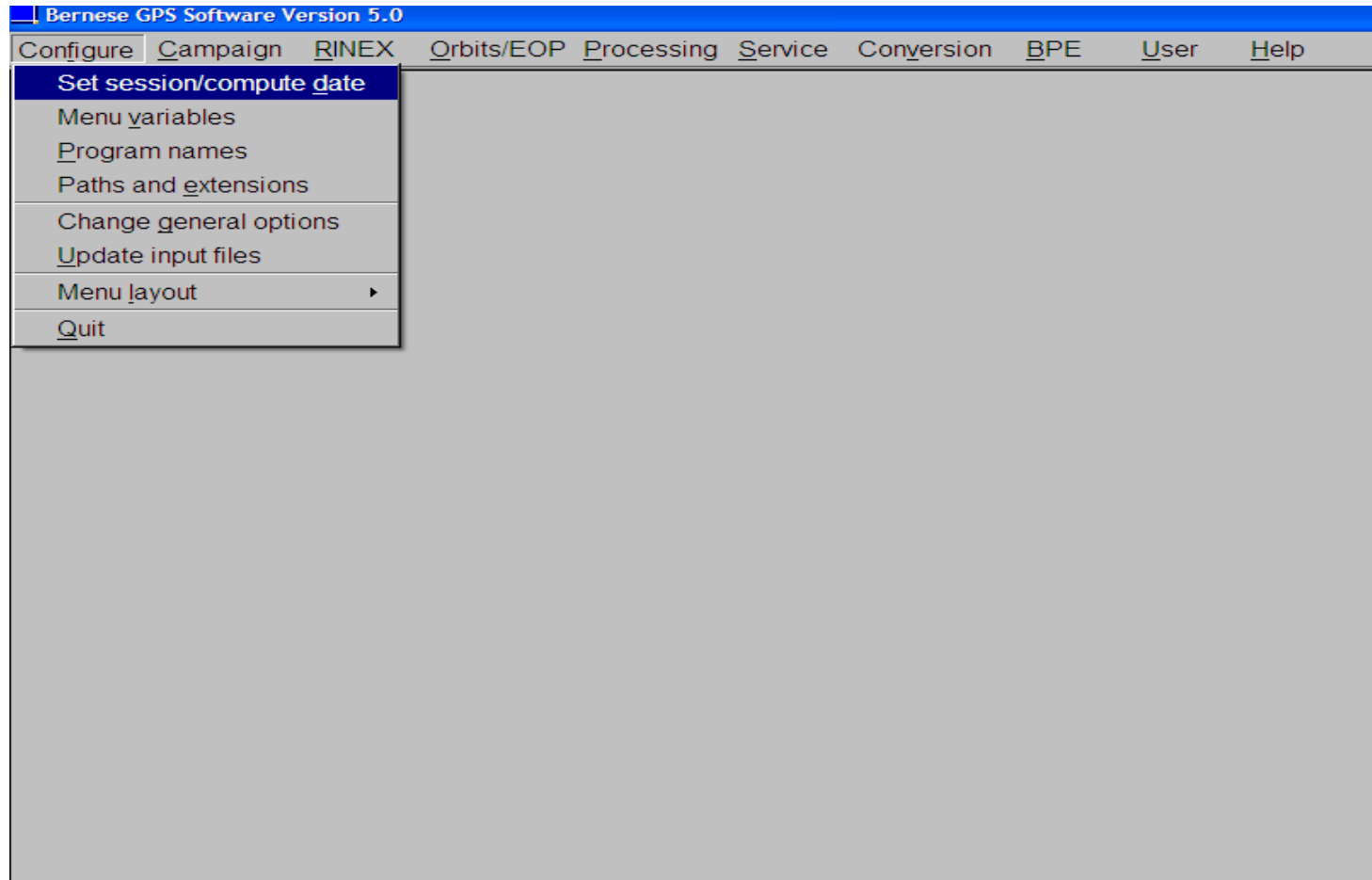


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SET DATE & SESSION





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SET DATE & SESSION

1. CLICK HERE TO EDIT THE DATE

2. CLICK HERE TO COMPUTE ALL

3. CLICK HERE TO TO SET THE SESSION. THIS WINDOW WILL APPEARED. SELECT AND OPEN

DONE ALL..CLICK SET, AND OK.

The screenshot shows the Bernese GPS Software Version 5.0 interface. The main window has a menu bar with options: Configure, Campaign, RINEX, Orbits/EOP, Processing, Service, Conversion, BPE, User, Help. Two dialog boxes are open: 'Date Selection Dialog' and 'SESSION TABLE'. The 'Date Selection Dialog' contains fields for Year, Month, Day (YYYY MM DD), Modified Julian Date, GPS Week, Day of Week (WWWW D), Year, Day of Year (YYYY DDD), Session Char, Session Table, and Job ID. It has buttons for '+1', '-1', 'Compute', 'Set', 'OK', 'Cancel', and 'Help'. The 'SESSION TABLE' dialog shows a file list with 'SESSIONS.SES' selected. It has fields for 'File name' and 'File type', and buttons for 'Open', 'Cancel', and 'Browse'. Red arrows point from the text instructions to the 'Date' field, the 'Compute' button, and the 'SESSIONS.SES' file in the 'SESSION TABLE' dialog. The status bar at the bottom shows 'User: user Campaign: \${P}BRUNEI \$Y+0=2002 \$S+0=1430' and a taskbar with various icons and the time '12:23 AM'.



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1. DATA PREPARATION:

1. Preparation of RINEX files

Data conversion from RINEX to Bernese format was using the **RXOBV3** programs. The output of the data conversion is four (4) files namely the code zero observation and header (*.CZO and *.CZH) and phase zero observation and header (*.PZO and *.PZH).

2. Orbit Computation

Two programs associated to the orbit computation are PRETAB and ORBGEN.

PRETAB: Compute a table of satellite positions in the IGS00/05/08 frame.

ORBGEN: To generate precise satellite orbit which namely standard orbit.



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2. DATA PREPROCESS:

Generally, three (3) programs for data pre-processing:

1. CODE SINGLE POINT POSITIONING (CODSPP)

Computes the corrections for synchronizing the receiver clocks with respect to GPS time.

2. SINGLE DIFFERENCE (SNGDIF)

SNGDIF program performs to generate baseline between GPS station in GPS network.

3. MANUAL AUTOMATIC PRE-PROCESSING (MAUPRP)

The phase data screening is to remove cycle slip.



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3. DATA PROCESSING:

- In GPS data processing, two main programs are utilized. **GPSEST** is to estimate the coordinate and **ADDNEQ2** is to adjust the coordinate.
- The quality of processing is determined by success rate of ambiguity resolved which is estimated in GPSEST program.
- This study utilize ambiguity resolution strategy from Quasi Ionosphere Free (QIF).



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RESULTS

File	Length (km)	#Amb	RMSO (mm)	Max/RMS L5 Amb (L5 Cycles)	Max/RMS L3 Amb (L3 Cycles)	#Amb	RMSO (mm)	#Amb Res (%)			
BAUK1560	1545.3	110	2.6	0.485	0.198	40	2.6	63.6			
MUUK1560	19.4	86	2.1	0.054	0.011	18	2.1	79.1			
PIUK1560	1265.8	126	2.3	0.479	0.170	58	2.4	54.0			
YAYR1560	0.0	106	0.9	0.020	0.006	8	1.0	92.5			
Tot:	4	707.6	428	2.1	0.485	0.125	0.095	0.031	124	2.1	71.0
Estimated Orbit Accuracy:			37.5+-	5.0 mm							
Basic Noise of L3 Amb :			2.8+-	0.2 mm /	0.026 L3 Cycles						

Table: The summary of successful of ambiguity resolved

- High percentage of resolved ambiguity indicated that the quality of data processing is well preformed.
- Average of more than 70% ambiguity
- RMS of 2mm (less than 1 cm)



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- Final campaign solution was carried out using minimally constraints adjustment with the introduction of Helmert's 3-parameter for translation.

RESULTS

LOCAL GEODETIC DATUM: ITRF2008
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS			
1	AUCK 50209M001	I W	-178.9	-62.9	-206.2	*
2	BAKO 23101M002	I W	311.7	181.4	-65.1	*
3	DARW 50134M001	I W	677.1	375.2	-163.2	*
4	GUAM 50501M002	I W	621.9	999.9	-438.4	*
5	IISC 22306M002	I W	0.0	0.0	0.0	
6	PIMO 22003M001	I W	732.4	-327.3	-307.1	*
7	TIDB 50103M108	I W	-646.5	-72.2	-487.1	*
8	YAR2 50107M004	I W	-978.2	-325.4	-700.9	*
RMS / COMPONENT			0.0	0.0	0.0	

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 3
RMS OF TRANSFORMATION : 0.0 MM

BARYCENTER COORDINATES:

LATITUDE : - 11 3 49.33
LONGITUDE : 126 13 18.35
HEIGHT : -1032.650 KM

PARAMETERS:

TRANSLATION IN N : -67.4 +- 0.0 MM
TRANSLATION IN E : -96.1 +- 0.0 MM
TRANSLATION IN U : 296.0 +- 0.0 MM

Figure: Output from Helmert's transformation



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RESULTS

A PRIORI INFORMATION

 Number of parameters in combined NEQ less than: 1000
 A priori sigma of unit weight: 0.0010 m

A PRIORI INFORMATION

 A priori sigma of unit weight: 0.0010 m

Station coordinates and velocities:

Local geodetic datum: \${X}/GEN\DATUM.

Datum name	Ell. param./ Scale	Shifts to WGS-84		Rotations to WGS-84	
ITRF2008	A = 6378137.000 m 1/F= 298.2572221 SC = 0.00000D+00	DX = 0.0000 m	DY = 0.0000 m	RX = 0.00000 arcsec	RZ = 0.00000 arcsec

A priori station coordinates: \${P}\LIZA\STA\IGS_08.CRD

num	Station name	obs e/f/h	X (m)	Y (m)	Z (m)	Latitude	Longitude
1	AUCK 50209M001	Y HELMR	-5105681.0751	461564.0381	-3782181.6600	-36 36 10.240203	116 33 31.688199
2	TIDB 50103M108	Y HELMR	-4460996.2402	2682557.0825	-3674443.5584	-35 23 57.145763	116 33 31.688199
3	VAR3 50107M008	Y ESTIM	-2389042.6217	5043313.5580	-3078525.7908	-29 2 47.403566	116 33 31.688199

num	Station name	obs e/f/h	X (m)	Y (m)	Z (m)	Latitude	Longitude
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RESULTS

A priori station coordinates WGS-84						A priori station coordinates Ellipsoidal in local geodetic da		
num	Station name	obs	e/f/h	X (m)	Y (m)	Z (m)	Latitude	Longitude
1	AUCK 50209M001	Y	HELMR	-5105681.0751	461564.0381	-3782181.6600	-36 36 10.240203	174 50 3.788018
2	TIDB 50103M108	Y	HELMR	-4460996.2402	2682557.0825	-3674443.5584	-35 23 57.145763	148 58 47.989835
3	YAR3 50107M008	Y	ESTIM	-2389042.6217	5043313.5580	-3078525.7908	-29 2 47.403566	115 20 49.728072
4	BAKO 23101M002	Y	HELMR	-1836969.1285	6065617.0858	-716257.8103	- 6 29 27.795999	106 50 56.077912
5	IISC 22306M002	Y	HELMR	1337936.4617	6070317.1024	1427876.7916	13 1 16.197430	77 34 13.352982
6	UKUR UKUR	Y	ESTIM	-2678449.0374	5762777.6672	543962.4543	4 55 31.133251	114 55 41.768399
7	YAR2 50107M004	Y	HELMR	-2389025.3940	5043316.8520	-3078530.8610	-29 2 47.616887	115 20 49.100491
8	DARW 50134M001	Y	HELMR	-4091359.0759	4684606.6311	-1408579.9998	-12 50 37.337607	131 7 57.861311
9	GUAM 50501M002	Y	HELMR	-5071312.7759	3568363.5143	1488904.3079	13 35 21.584612	144 52 6.101534
10	MURA MURA	Y	ESTIM	-2691871.2426	5755368.4001	555842.6524	5 1 59.375441	115 3 58.283680
11	PIMO 22003M001	Y	HELMR	-3186293.8000	5286624.2800	1601158.3100	14 38 8.591681	121 4 39.829901

Network constraints:

Component	A priori sigma	Unit
DX Translation Coordinates	0.00001	m
DY Translation Coordinates	0.00001	m
DZ Translation Coordinates	0.00001	m

Site-specific troposphere parameters:

A priori troposphere model: Niell, dry part only
Meteo/Trop.delay values: Extrapolated

Mapping function used for delay estimation: Wet Niell
Troposphere gradient estimation: No



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RESULTS

STATION NAME	LATITUDE	LONGITUDE	LATITUDE	LONGITUDE	HEIGHT (M)
UKUR	4° 55' 31.13325"	114° 55' 41.76840"	4° 55' 31.13325"	114° 55' 41.768399"	74.740
MURA	5° 1' 59.36289"	115° 3' 58.32242"	5° 1' 59.375441"	115° 3' 58.283680 "	63.822 66.468

Δ Latitude	0°0' 0.01"
Δ Latitude	0°0' 0.04"
Δ Height	2.646



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CONCLUSION

- The lack of availability of IGS station nearest to Brunei region make the processing of long baseline is demanded.
- The long baseline processing only capable processed from high scientific software such as Bernese.
- From the Result of processing : Mura CORS has a Displacement
- Further studies will be conducted to verify is it due to the Earthquake etc as Mura is nearest to a river / building itself.
- Continuous study will be made on prior Earthquake (Post Seismic) and Inter Seismic for comparison



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Thank You
Terima Kasih