Capacity Building Activities on GNSS in Japan

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Contents

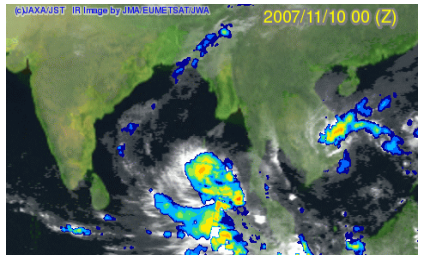
- Back ground of Geospatial Information System (GIS)
- University Consortium on GIS/GNSS Education

  GESTISS(Geospatial and Space Technology consortium for Innovative Social Services)
- Summer Seminar on GNSS organized by IPNTJ
- Conclusion

Social Benefit Services v… …ucture (Observation, Communication, Positioning,… …g Service for Bangladesh

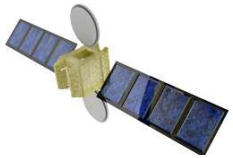
Satellite communication

Satellite observation



Precipitation measurement from space

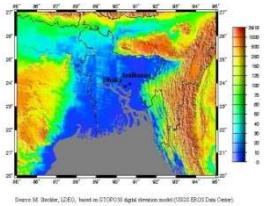
Real-tim… …ata



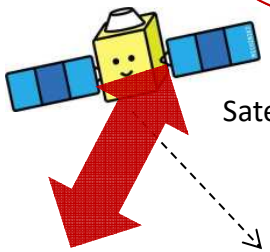
Data relay

Satellite observation

3D topo data
Land cover data



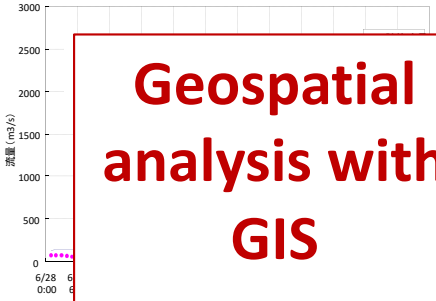
Satellite positioning



Satellite Positioning

Water runoff s…lation

Estimating people distribution for better evacuation guidance



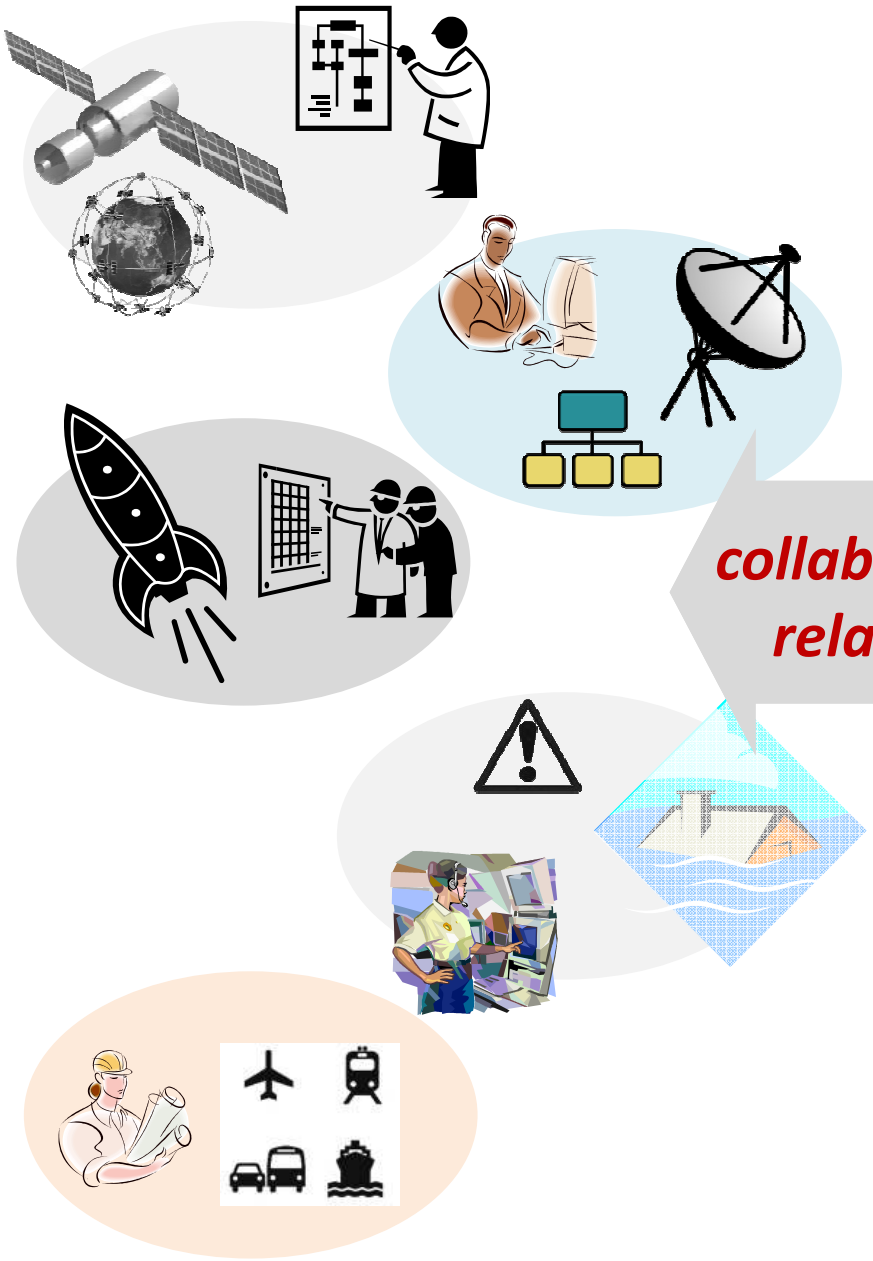
Data sharing with cellular phone network

Geospatial analysis with GIS

Information dissemination to people through cellular phone

Water level forecast
Flood forecast

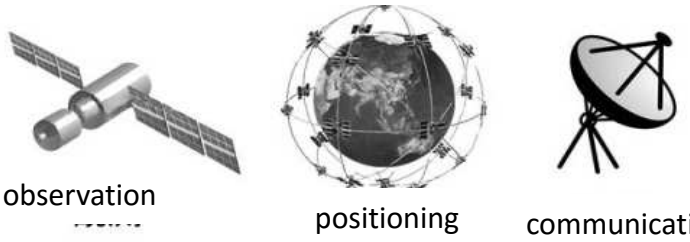
Human Resource Development for individual technology



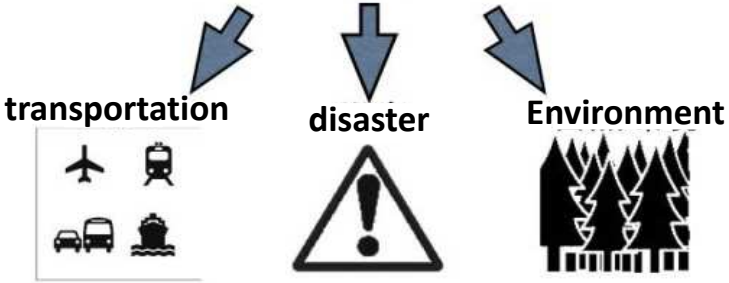
Designing/managing innovative social services with space infrastructure

collaborative relations

Space infrastructure



Service designer/manager to integrate space infrastructure and social benefit services



Social benefit services

Three Universities Involved in GESTISS

GESTISS(Geospatial and Space Technology Consortium for Innovative Social Services)

- University of Tokyo : GIS
- Tokyo University of Marine Science and Technology : GNSS
- Keio University : SDM (System Design and Management)

Visiting Lecture in Asian Institute of Technology (Bangkok) : 6-class hours for each subject in each semester.

Three-year project sponsored by MEXT (Japanese Ministry of Education)

IPNTJ

国立大学法人
東京海洋大学
Tokyo University of Marine Science and Technology

The First Summer School on GNSS in Tokyo

Organized by The Institute of Positioning, Navigation and Timing of Japan

Co-organized by Faculty of Marine Technology, Tokyo University of Marine Science and Technology

Supported by Multi-GNSS Asia and GESTISS

2013/08/19-24

MGA

GESTISS
GEospatial and Space Technology consortium for Innovative Social Service

Outline of International Summer School

- Period : 2013/08/19-08/24
- Place : Tokyo University of Maine Science and Technology (TUMSAT), Japan
- Organized by : Dr. Yasuda, Prof. Emeritus of TUMSAT
  The Institute of Positioning, Navigation and Timing of Japan
- Instructors:

Dr. Yasuda : Professor Emeritus at TUMSAT
Dr. Kubo : Associate Prof. at TUMSAT

Mr. Takasu : Inventor of RTK-LIB, GNSS Specialist at TUMSAT

Dr. Petrovski : Guest Prof. at TUMSAT, Director of iP-Solutions, Japan, co-author of 'Digital Satellite Navigation and Geophysics' CUP book

- Expected Attendees : Japanese and foreign students with post graduate level & young instructors who are in charge of teaching GNSS in their own countries
- Number of participants : 40 (Foreigner : 20, Japanese : 20)
- Supported by : MGA(Multi-GNSS Asia), GESTISS(Geospatial and Space Technology Consortium for Innovative Social Service)
- Language : English

IPNTJ

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Call for Participants 2013/4

- Potential Candidates
 --Beginners with master level (Preferable who Specialized in Electronics or Information & Communication Technologies)
 --Young instructors who are in charge of teaching GNSS in their own countries.
- Call for Scholarship* Application until 30th April.
- * (Round Trip Ticket + Accommodations + fee) up to 10 participants.
- Acceptance Notification by 15th May.
- Call for Application until 40 Applicants.
- Application form will be prepared shortly at
  http://www.gnss-pnt.org/
- Contact: Prof. Akio Yasuda at Tokyo University of Marine Science and Technology, yasuda@kaiyodai.ac.jp

IPNTJ

The Institute of Positioning, Navigation and Timing of Japan

IPNTJ

国立大学法人
東京海洋大学
Tokyo University of Marine Science and Technology

Participants

Country	No.
Taiwan	6*
Thailand	4**
Philippine	2
Russia	2
Indonesia	2
Sri Lanka	1
Nepal	1
Vietnam	1
Italy	1
Total	20

Age	FRN No.	JPN No.
38+	1	3
35	3	1
34	1	1
31-32	2	2
30	3	1
27-29	3	2
25-26	1	5
24	4	3
21-23	2	2
Total	20	20

Jobs from Abroad	No.
Student	9
Academics	5
Institute	3
Officer	1
Private Co.	2
Total	20

Jobs of JPN Participants	No.
Private Co.	15
Officer	1
Student	4
Total	20

* One from Philippines

** One from Sri Lanka, another from Nepal

14 of them were invited including partial support

Introduction of GNSS Technology

(1st day)

- O. Introduction **by Dr. A. Yasuda**
- 1. History of radio navigation
- 2. What is GNSS?
- 3. Global evolution of GNSSs

Evaluation (1 – 5)
Deg. of Difficulty 3.1 (Std. 3)
Satisfaction 4.0

- A. Overview of GNSS Positioning **by Dr. N. Kubo**
- 1. Description of satellite orbits, coordinates transformation, and time systems.
- 2. GNSS observables
- 3. Pseudorange and carrier phase observables.
- 4. GNSS errors (Atmosphere, ionosphere, multipath, satellite clock and orbit)
- 5. Point positioning using pseudorange
-

Evaluation (1 – 5)
Deg. of Difficulty 3.3 (Std. 3)
Satisfaction 4.3

Positioning Algorithm and RTKLIB

Class B (2nd & 3rd Days) by **Mr. T. Takasu**

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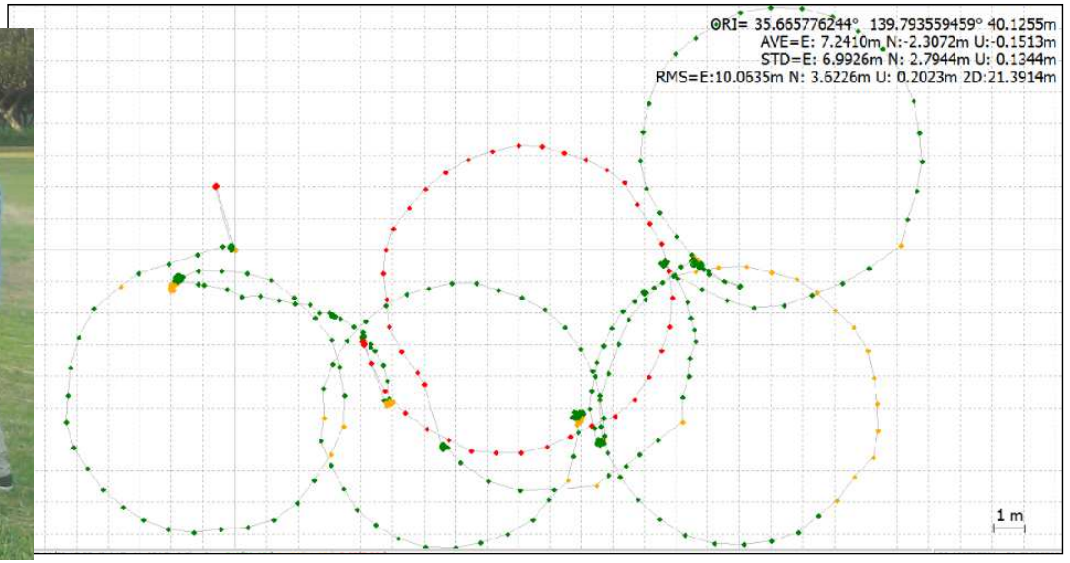
Positioning Algorithm and RTKLIB

Class B (2nd & 3rd Days) by Mr. T. Takasu



3. Practice of GNSS data analysis with RTKLIB

It includes the usage of APs: RTKPOST, RTKNAVI, RTKPLOT and RTKCONV, options setting and detailed instructions to deal with real GNSS data for both of post-processing and real-time.

4. Advanced Topics

It provides some advanced topics in GNSS gy.

Evaluation (1 – 5)
Deg. of Difficulty 3.6 (Std. 3)
Satisfaction 4.2

GNSS Signal and Receiver

Class C（4th & 5th Days）by **Dr. I. Petrovski**

Day 1. Introduction into GNSS signals.

1. Spread-spectrum concept and benefits for GNSS. 2. GNSS frequencies ar
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3. Specific of various receiver de
Conventional receivers / Mobile / Software receivers.

4. Practise to operate real-time software receiver with simulated and live GNSS signals.

Evaluation (1 – 5)
Deg. of Difficulty 4.0 (Std. 3)
Satisfaction 4.2

Evaluation (1 – 5)
Deg. of Difficulty 3.5 (Std. 3)
Satisfaction 3.7

Total Average Evaluation (1 – 5)
Deg. of Difficulty 3.5 (Std. 3)
Satisfaction 4.1

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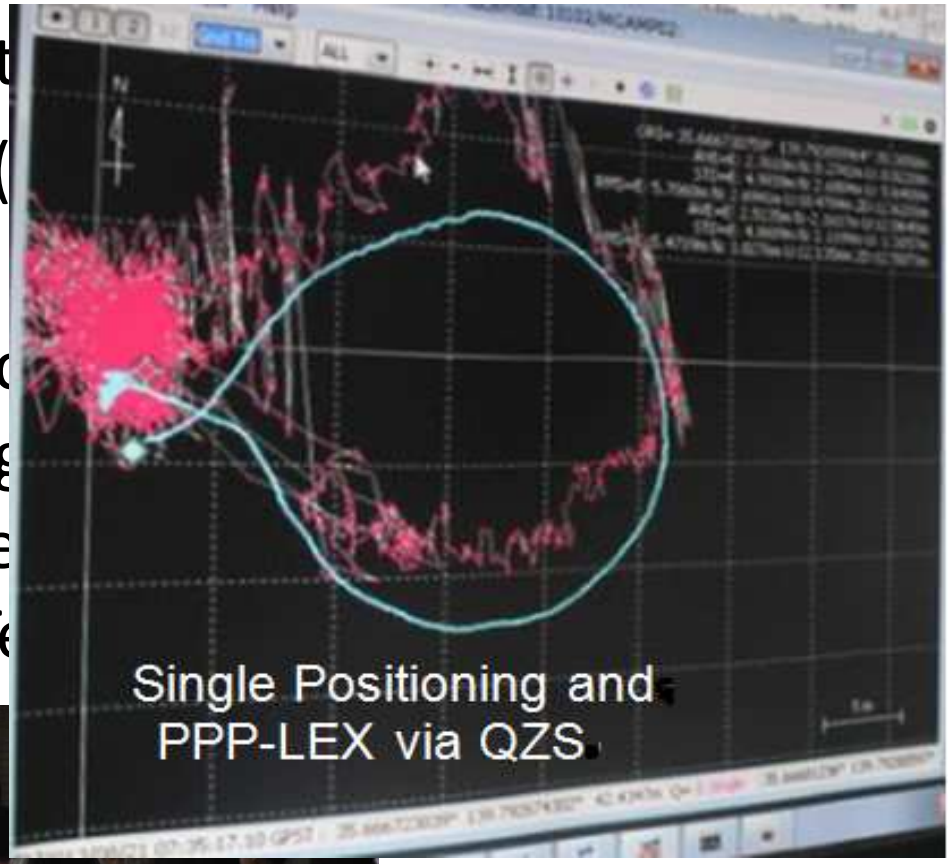
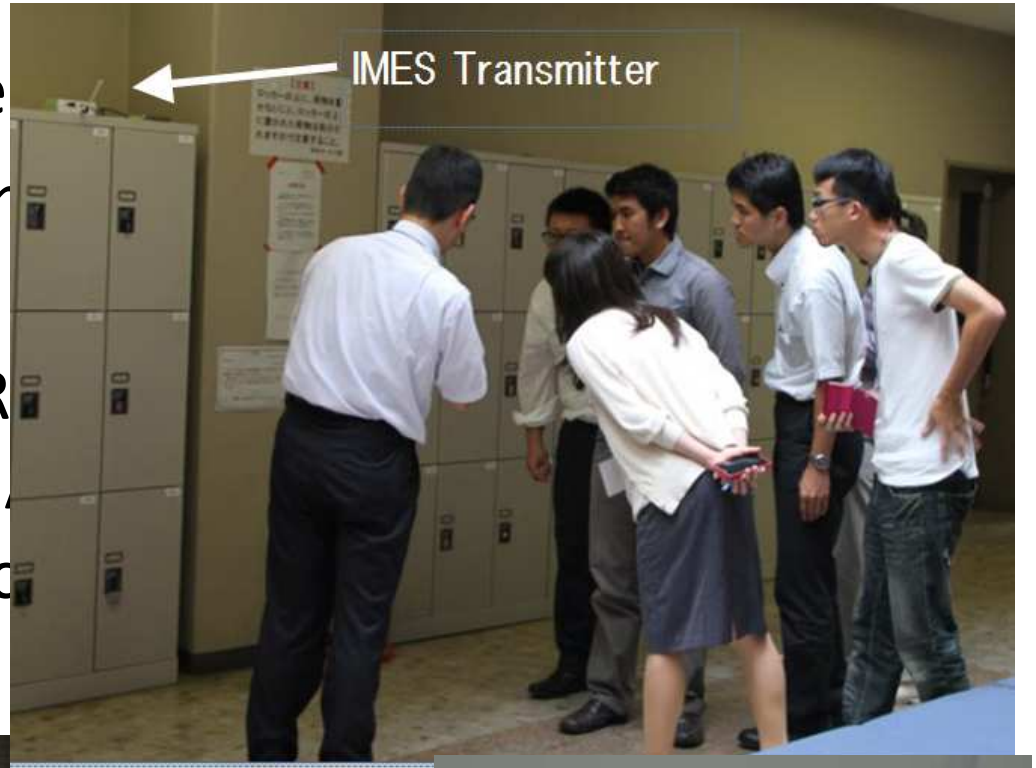


Demonstrations

- GNSS Simulator (Spire
- Indoor Message System
  Systems)
- Quasi-Zenith Satellite R
  Aerospace Exploration
- Unmanned Aerial Vehic
  (Information & Science



Demonstrations

- GNSS Simulator (Spirent Communications)
- Indoor Message System (Hitachi Industrial Equipment Systems)
- Quasi-Zenith Satellite Re
  Aerospace Exploration A
- Unmanned Aerial Vehic
  (Information & Science

UAV : Falcon-PARS

Workshop for the school participants
(6th day)

1) "Custom GNSS solutions for applied and infrastructural tasks, Russian experience", Anton Belokrylov (Industrial Geodetic Systems, Russia)

2)"My experience on GNSS in QZSS project", Ryo Iwama (NEC, Japan)

3)”The precise localization system for rail vehicle”, (Italy)

4)” Ionospheric effect on GNSS Performance in Indonesia”, Slamet Supriadi (LAPAN, Indonesia)

5)"Application of GPS radio occultation data to single-frequency GPS positioning", Ernest Macalalad (National Central University, Taiwan)

6)”Seismic wave investigations for far-field and near-field earthquake using Taiwan dense CGPS network”, Huang-Kai Hung (Department of Earth Sciences, National Cheng Kung University, Taiwan)

7)"Identification of Characteristic of Kinematic GPS For Monitoring Earth Crust Deformation", Anjar Dimara Sakti (Bandung Institute of Technology, Indonesia)

Group Discussion (6th day)

conducted by Mr. Tateshita (JAXA)

Supporters

- **Sponsors:**

  Furuno Electric

  PASCO Cooperation

  Spirent Communications

- **Cooperated by:**

  JAXA iP-Solution SensorComm

  Information & Science Techno-System

  Hitachi Industrial Equipment Systems

Certificate

IPNTJ

国立大学法人
東京海洋大学
Tokyo University of Marine Science and Technology

The First Summer School on GNSS in Tokyo

organized by The Institute of Positioning, Navigation, and Timing of Japan
co-organized by Faculty of Marine Technology, Tokyo University of Marine Science and Technology

The Institute of Positioning, Navigation and Timing of Japan, hereby certifies that

Rhonalyn L. Vergara

has completed the 6-day course on GNSS to cultivate the comprehensive knowledge, including receiver architecture and positioning software with practices and demonstrations, that was held on 19th—24th August 2013 at Tokyo University of Marine Science and Technology.

The organizer :

Prof. Akio Yasuda
President of IPNTJ

MGA

Supported by Multi-GNSS Asia, and
GEospatial and Space Technology consortium for Innovative Social Services

GESTISS

Conclude Remarks

- Introduce the framework of GESTISS.
- Introduce the first Summer School in Tokyo.
- The 6-day course of the lecture were successfully held with high satisfactions.
- Next Summer School will be held in August 2014.
- Please check the IPNTJ home page time to time. http://www.gnss-pnt.org/

Thank you very much for your attention.

Time Table of the Summer School

Time Table for GNSS Summer School 8/19-24

	Aug. 19	Aug. 20	Aug. 21	Aug. 22	Aug. 23	Aug. 24
	Monday	Teusday	Wednesday	Thurday	Friday	Saturday
0840-0850	Opening/Guidance					
0850-1010	Introduction	Class B-1	Class B-6	Class C-1	Class C-6	
1010-1030	Break	Break	Break	Break	Break	
1030-1150	Class A-1	Class B-2	Class B-7	Class C-2	Class C-7	**UAV Demo**
1150-1300	Lunch	Lunch	Lunch	Lunch	Lunch	
1300-1420	Class A-2	Class B-3	Class B-8	**IMES-Demo**	Class C-8	workshop
1420-1440	Break	Break	Break	Break	Break	Groupe Discussion
1440-1600	Class A-3	Class B-4	Class B-9	Class C-4	Class C-9	
1600-1620	**Spirent Seminar (1H)**	Break	Break	Break	Break	
1620-1740	Self introduction (1H)	Class B-5	**QZSS-Demo**	Class C-5	**UAV-Appli**	Closing
1800-	Welcome Party				Farewell party	
		1 class=80 minutes				

Instructors		
	Introduction	Dr. Akio Yasuda
	Class-A	Dr. Nobuaki Kubo
	Class-B	Mr. Tomoji Takasu
	Class-C	Dr. Ivan Petrovski

RTKLIB

- **Open source program package for RTK-GPS**
  - Has been developed by Mr. Takasu since 2006
  - Latest version: 2.4.1
  - More than 20,000 downloads
  - Version 2.4.2 will be released at the end of March
- **Portable C library + several positioning APs**
  - GUI APs on Windows
  - Console APs on Linux etc...

http://www.rtklib.com

Application Programs (APs)

RTKNAVI : Real-time positioning (Raw data from Receiver)
RTKPOST : Post-processing analysis (RINEX ----------)
RTKPLOT : Plot GNSS data and visibility analysis
RTKCONV : RINEX converter for raw receiver data