1st Regional Training on Toponymy

GNSS Receiver Demonstration

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Outline

- **Introduction to GNSS**

- **GNSS Receiver**

- **Demonstration**

# 1.0 Introduction to GNSS

GNSS Basics

Global Navigation Satellite Systems

- A space-based satellite navigation system that provides autonomous positioning and timing information with a global coverage.

- Encompasses all existing and planned satellite navigation systems such as GPS, Glonass, Galileo, Beidou, etc.

- Common characteristics:

  - Satellites transmit signals to the users

  - One-way communication between satellite and users*
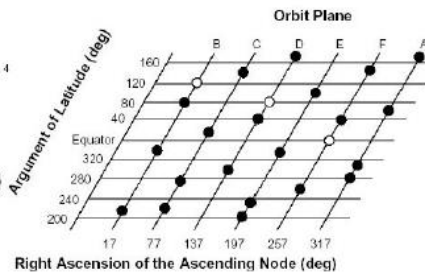
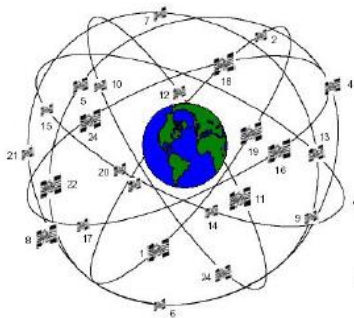 - All use atomic timekeeping devices
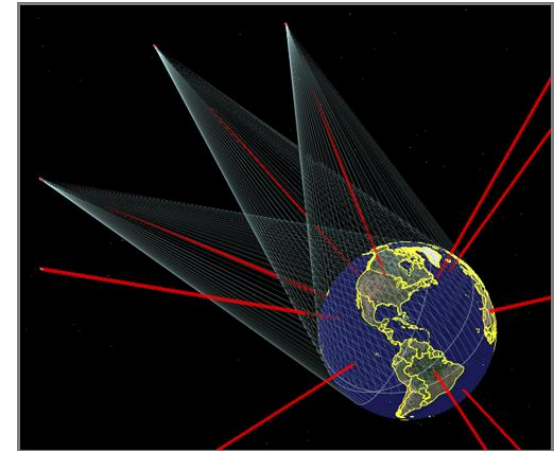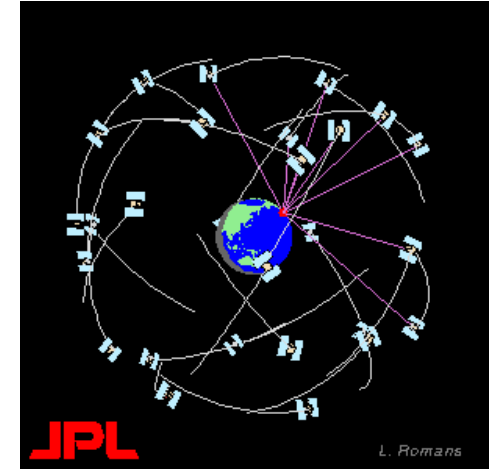
GNSS Basics

System Overview
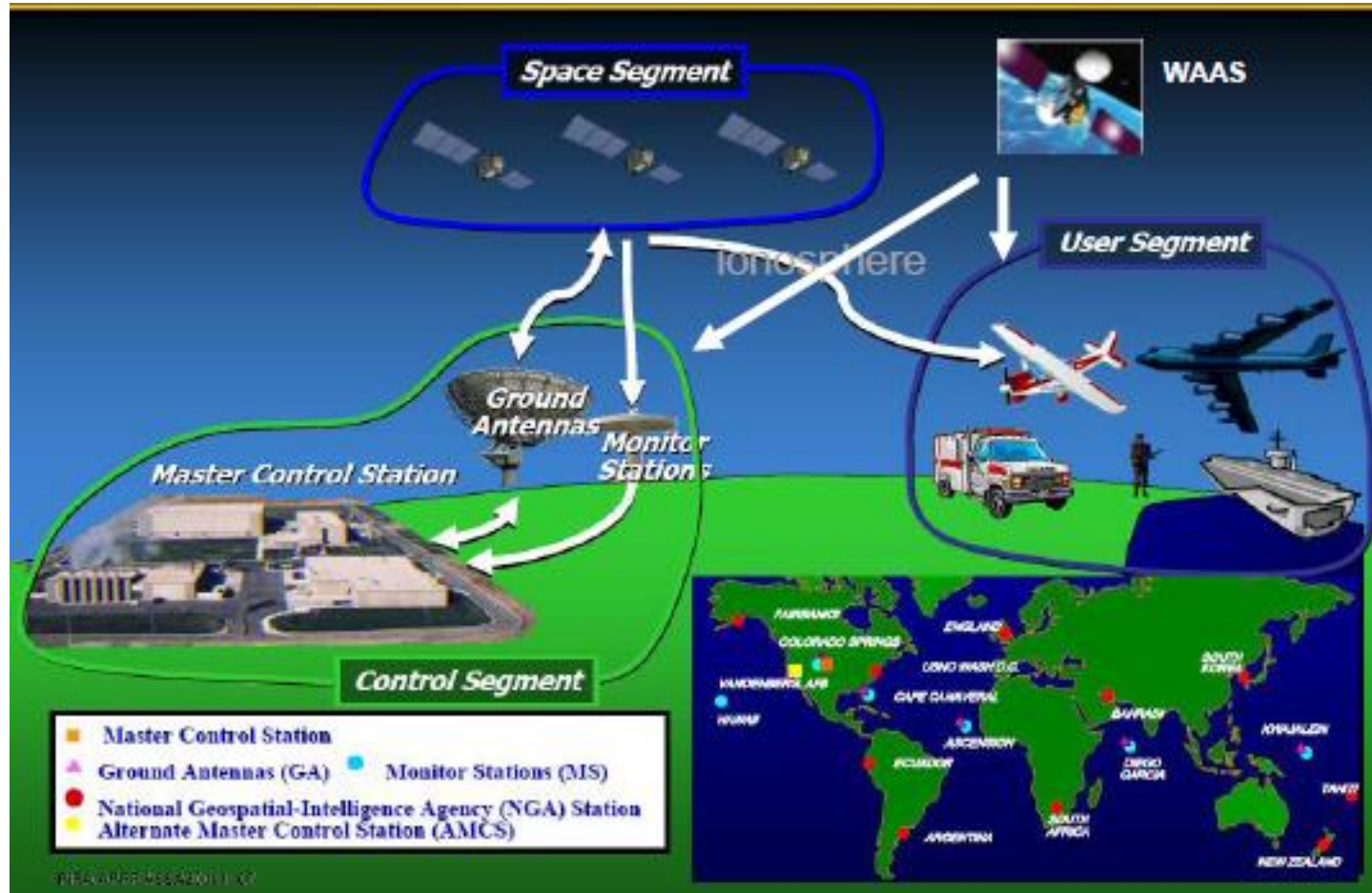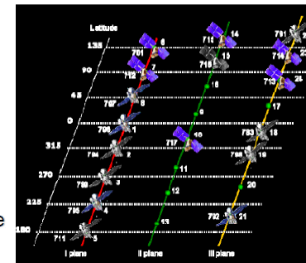
GNSS Basics

GNSS Segments

- Space segment
  - Comprises of the constellation of satellites
  - Each satellite broadcasts to the user an accurate time reference and a navigation message with ephemeris information

GLONASS
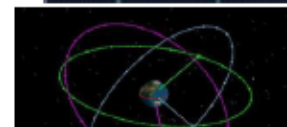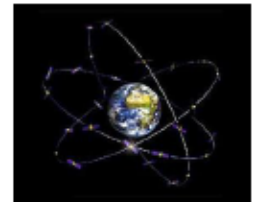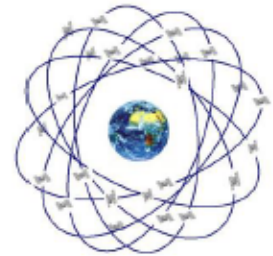
Constellation status in 2007

- 17 satellites in orbit:
  - 10 GLONASS (old)
  - 7 GLONASS-M (new)
- 10 satellites healthy
- 1 satellite in commissioning status
- 1 satellite in maintenance
- 5 satellites in decommissioning phase

GNSS Basics

GNSS Constellations
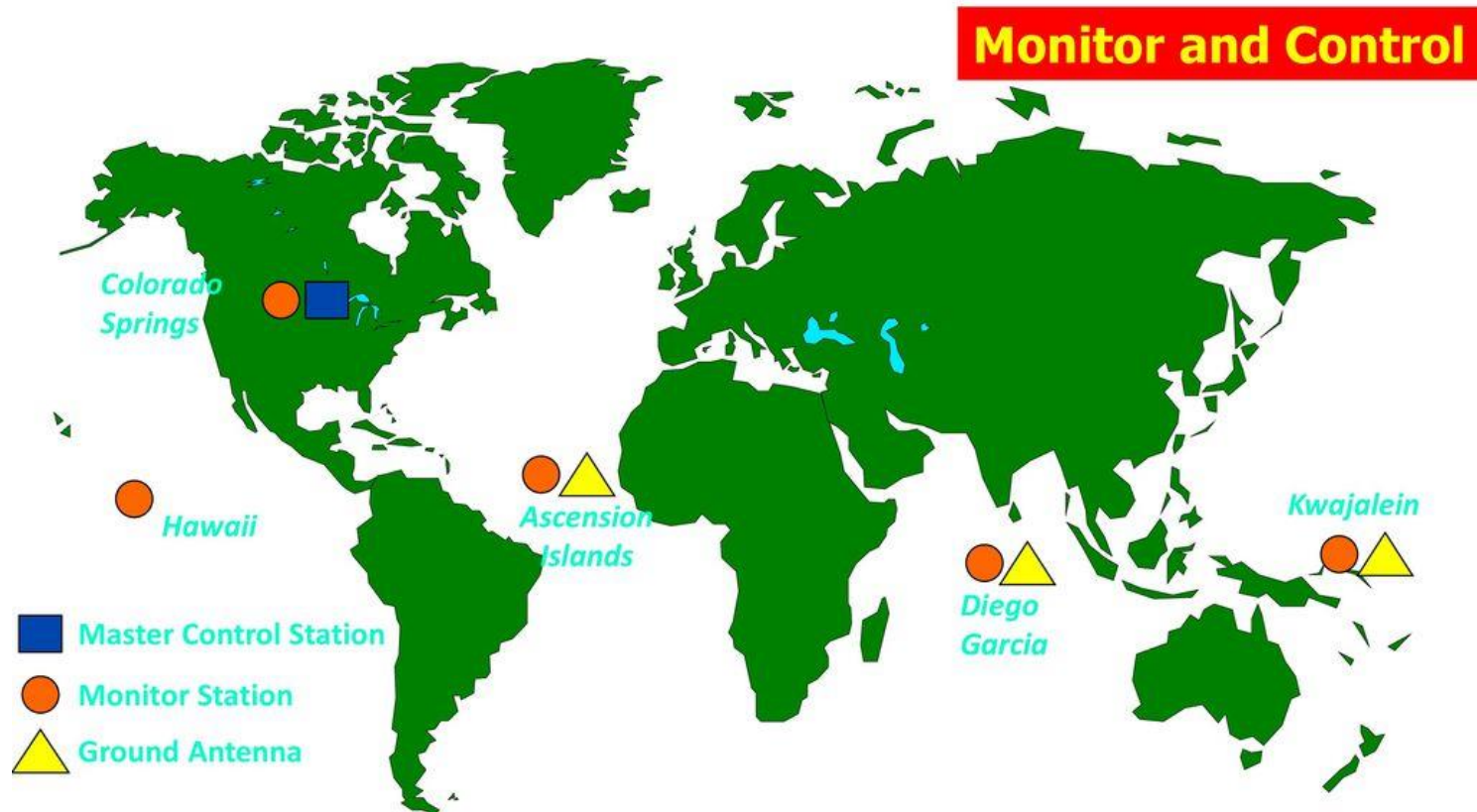
- Global systems
    - USA   Global Positioning System (GPS)
    - Russia   Global'naya Navigatsionnaya Sputnikovaya Sistema (GLONASS)
    - EU   Galileo
    - China   BeiDou

- Regional and augmentation systems
    - Japan   Quasi-Zenith Satellite System (QZSS)
    - India   Indian Regional Navigation Satellite System (IRNSS)
    - WAAS, EGNOS, MSAS, GAGAN, SDCM

GNSS Basics

GNSS Segments

GPS Control Segment

Monitor and Control

Colorado Springs

Hawaii

Ascension Islands

Diego Garcia

Kwajalein

■ Master Control Station

● Monitor Station

▲ Ground Antenna

GNSS Basics

GNSS Segments

- **User Segment**
    - Processes the signals received from the satellites and recovers user's position.
    - Made up of a wide range of different receivers, with different performance levels
    - Functionalities common to all receivers:
        - Identification of the satellites in view
        - Estimation of the user-satellite distance
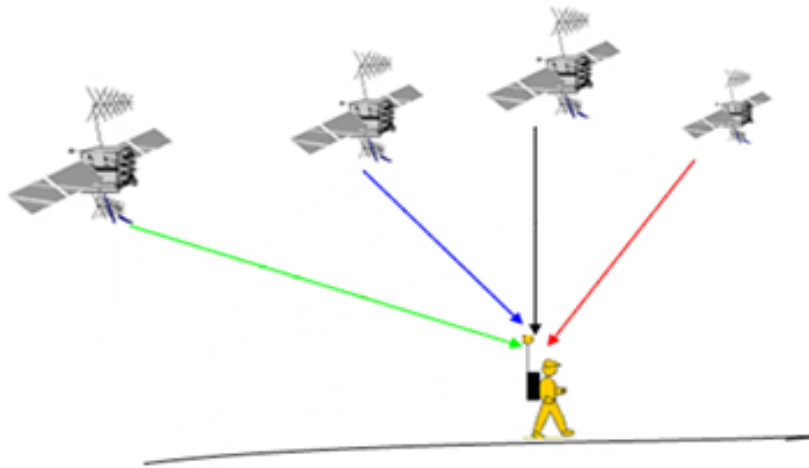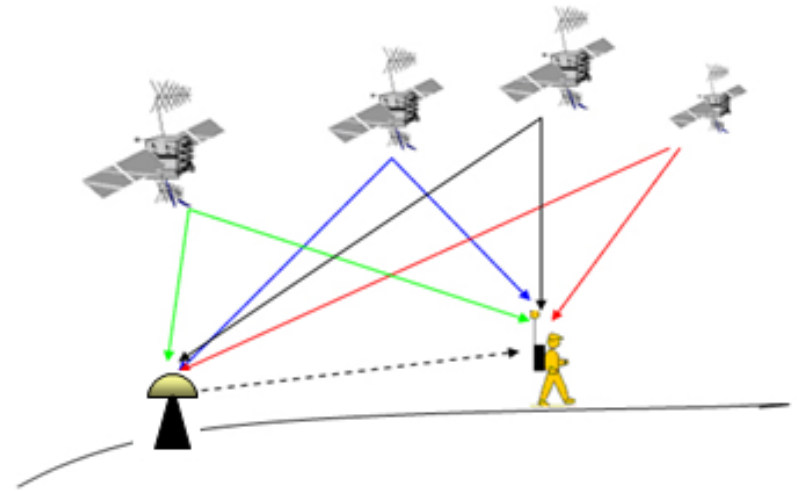   - Triangulation

2.0 GNSS Receiver

How does it work?

✳ Absolute Positioning vs. ✳ Relative Positioning

- Consists of one GNSS receiver + four or more satellites

- Expected precision = 3 to 10 meters

- Data from a precisely known reference station is used to correct the position data gathered from a roving GNSS receiver
- Technique used to enhance the quality of positional data gathered using GNSS receivers.
- Expected precision = sub-meter

GNSS Receiver

These devices can automatically include **LATITUDE** and **LONGITUDE** coordinates to anything that we pinpoint on earth while using the device. It can also record where we are going.

GNSS Receiver
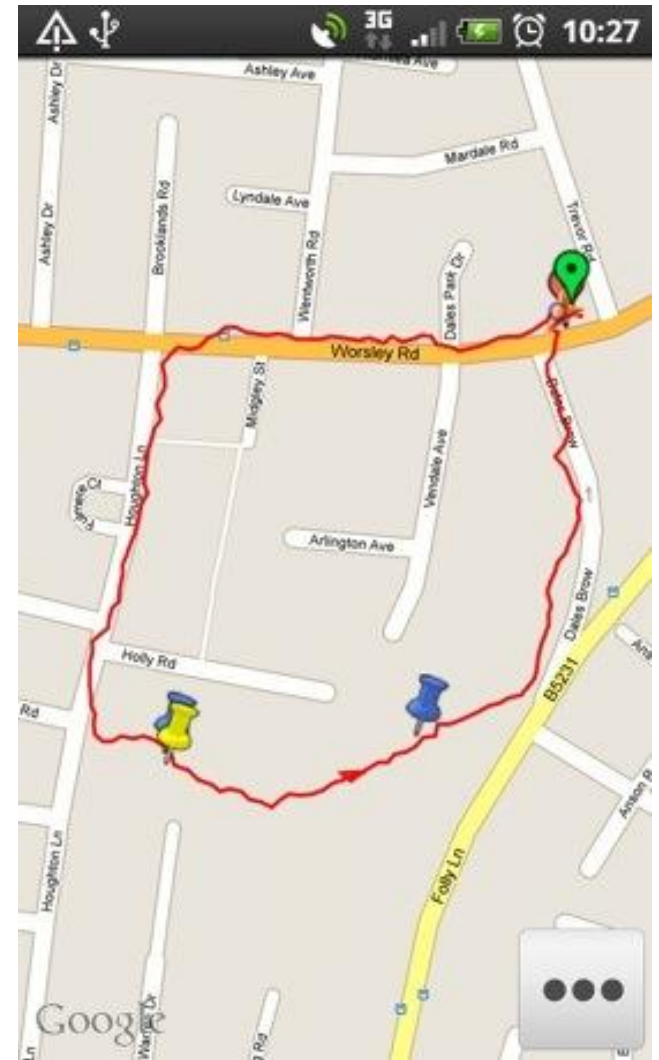
Tracks and Waypoints

GNSS Receiver

GPX

(GPS exchange format)

is a common GPS data

format from these devices and can be used for
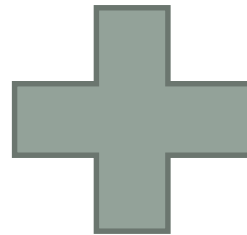
software applications.

Examples:

tracks.gpx

waypoints.gpx

GNSS Receiver

Devices with digital camera and global positioning system (GPS)* capability can automatically include **LATITUDE** and **LONGITUDE** coordinates in its pictures. We then have a **geotagged photo**.

or other satellite navigation systems

GNSS Receiver

DSC00002 Properties

General | Security | **Details** | Previous Versions

Property	Value
Sharpness	
White balance	
Photometric interpretation	
Digital zoom	
EXIF version	0220
GPS	
Latitude	9; 12; 37.043180740947719
Longitude	124; 46; 10.895889523147...
Altitude	39.00578336206403
File	
Name	DSC00002.JPG
Item type	ACDSee Pro 3 JPEG Image
Folder path	E:\Pictures\2013052130_C...
Date created	9/2/2013 7:13 AM
Date modified	5/23/2013 9:04 AM
Size	1.19 MB
Attributes	A
Offline availability	

Remove Properties and Personal Information
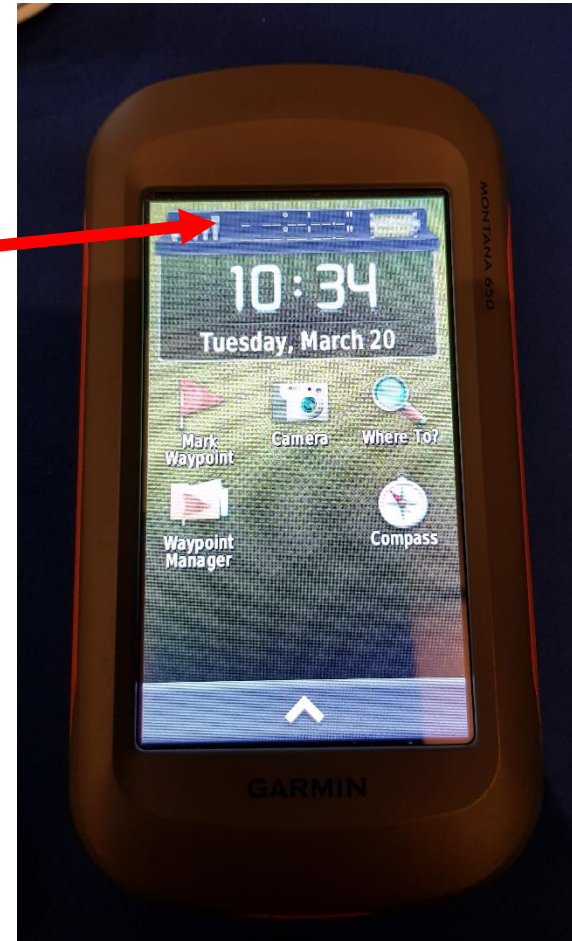
OK   Cancel   Apply

3.0 GNSS Receiver Demonstration

GNSS Demonstration
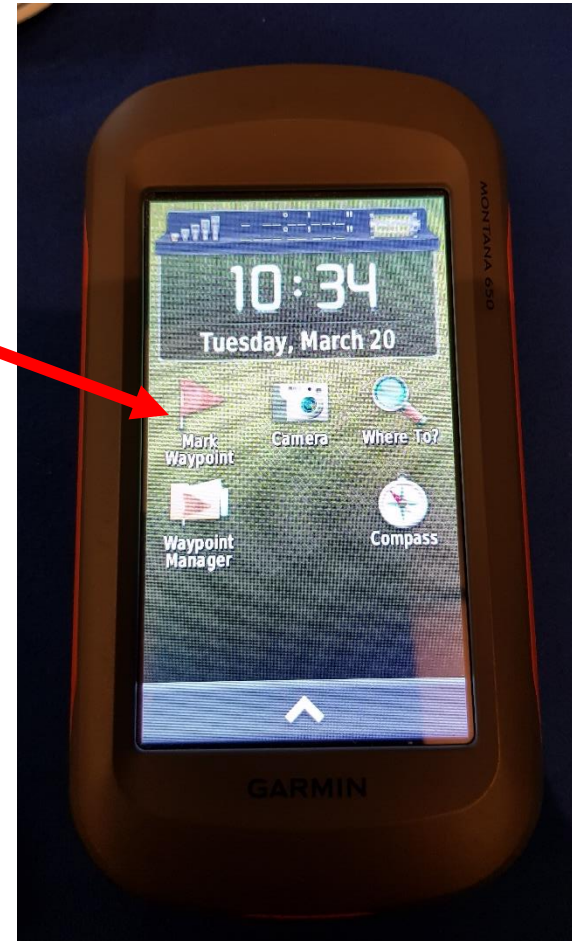
Garmin Montana 650

- Turn on the Handheld GNSS Receiver

- Check if you have already locked on the satellites

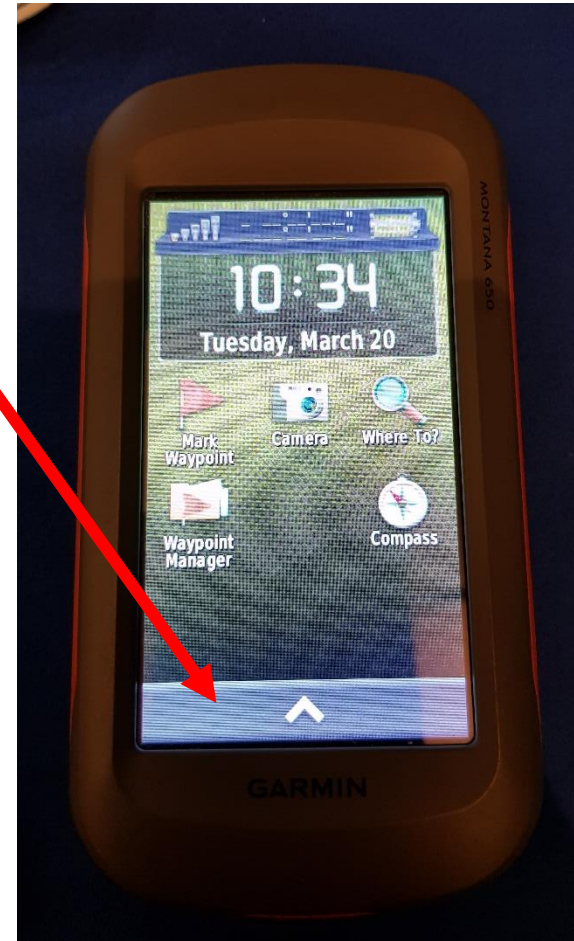# GNSS Demonstration

Garmin Montana 650

- Click **Mark Waypoint**
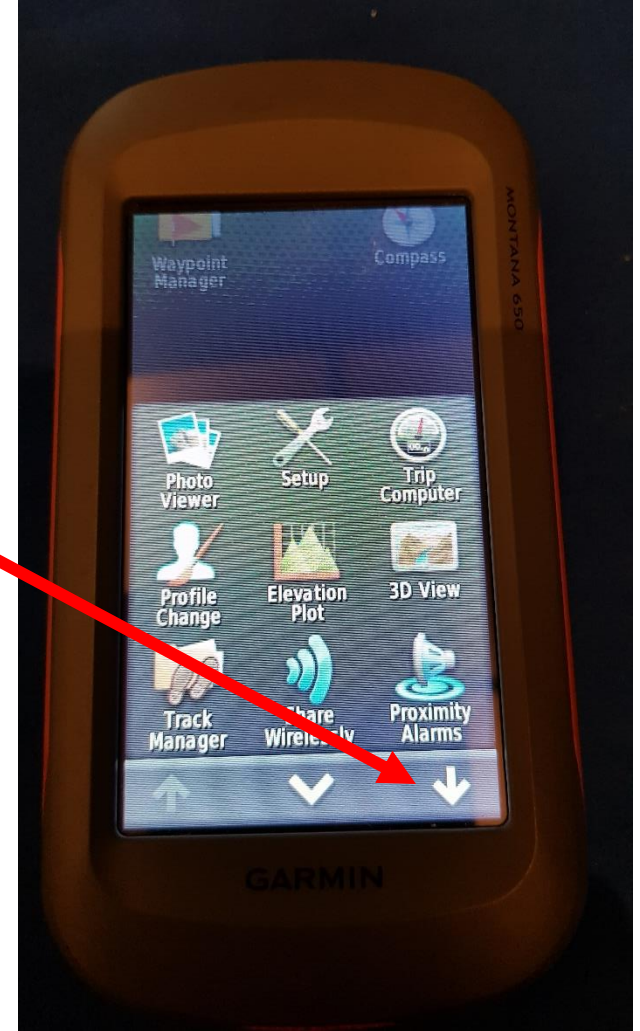
GNSS Demonstration

Garmin Montana 650

- If you want to display the map, press ^
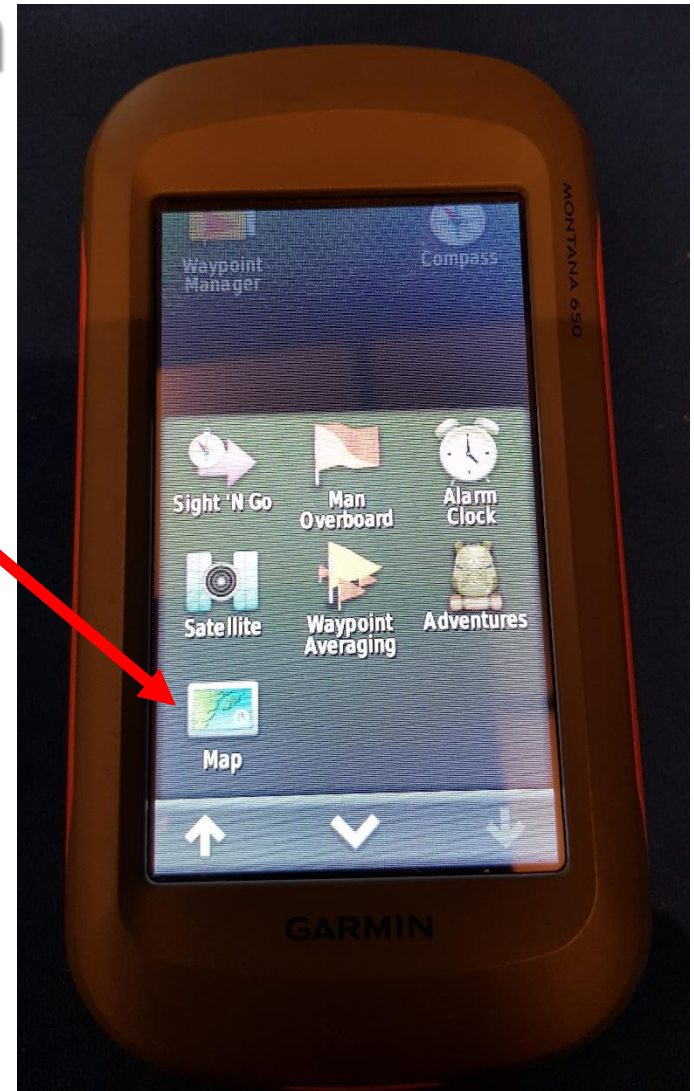
GNSS Demonstration

Garmin Montana 650

- If you want to display the map, press ⬇
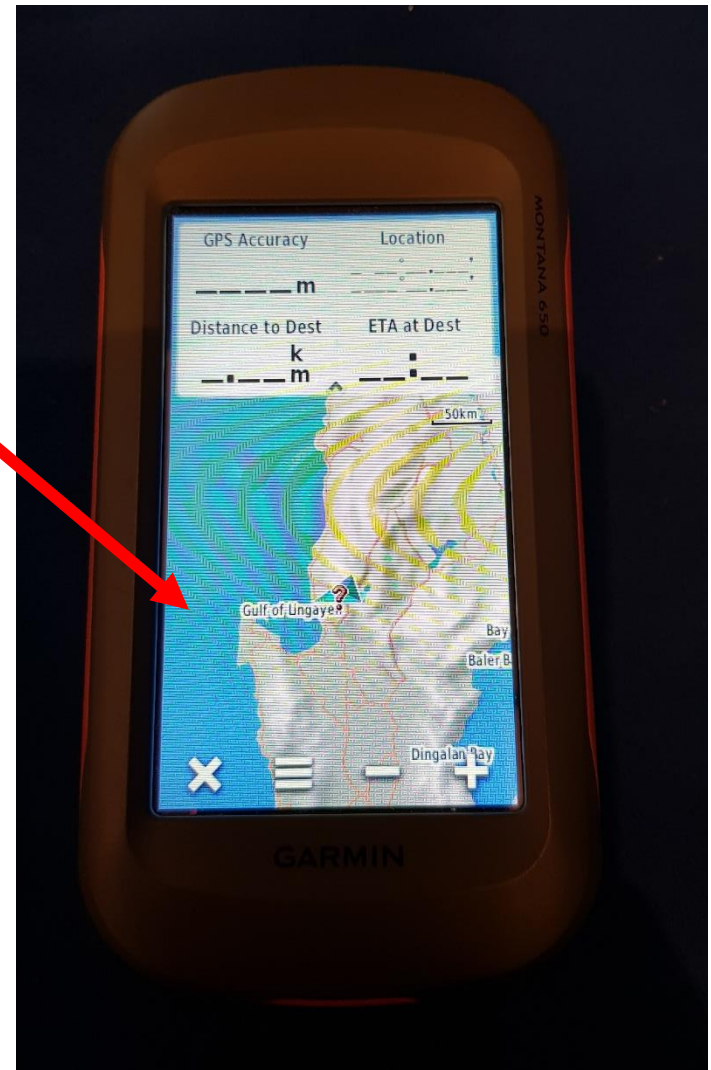
GNSS Demonstration

Garmin Montana 650

- If you want to display the map, press **Map**

GNSS Demonstration
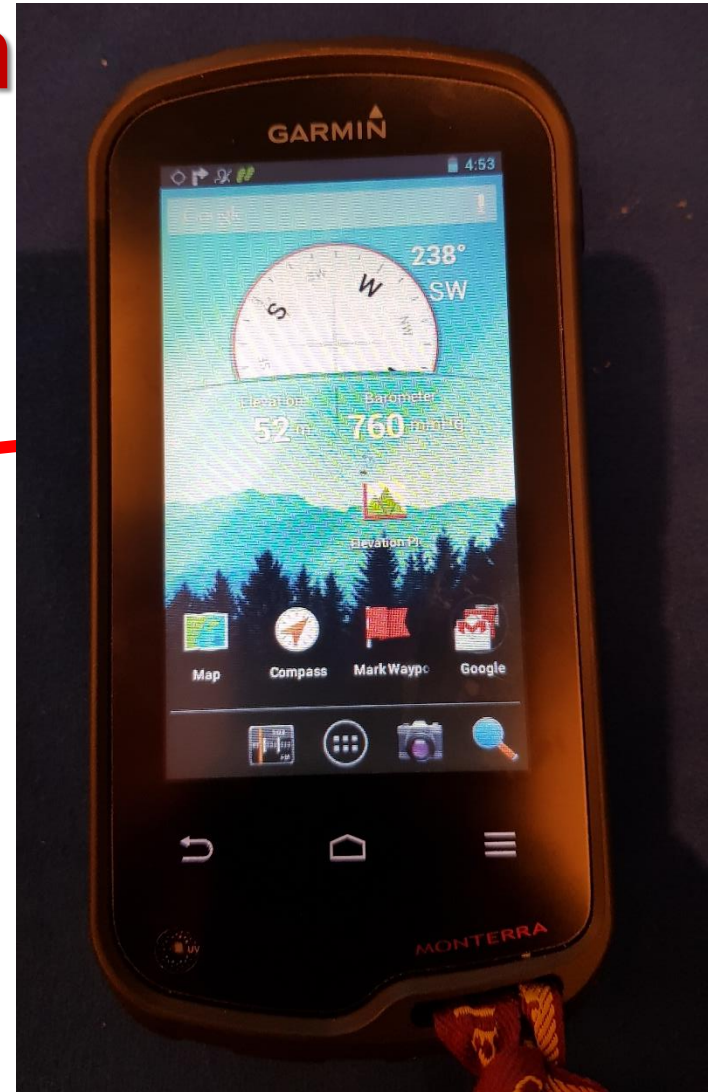
Garmin Montana 650

• This will be the display

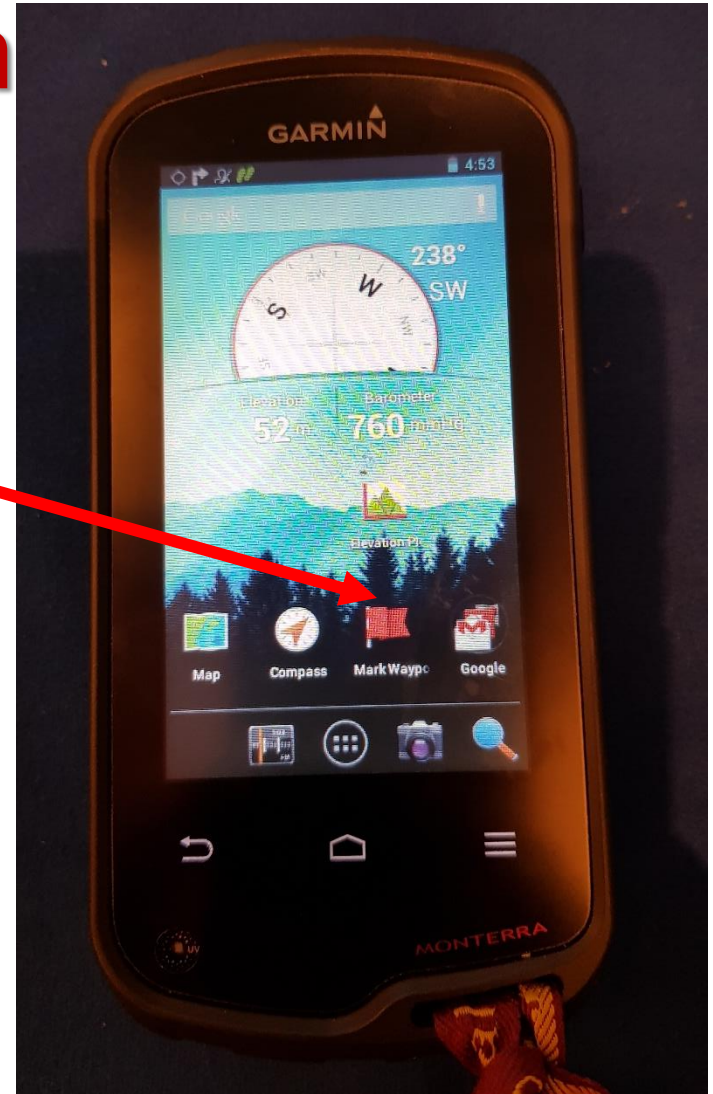# GNSS Demonstration

Garmin Monterra

- Turn on the Handheld GNSS Receiver

- Check if you have already locked on the satellites
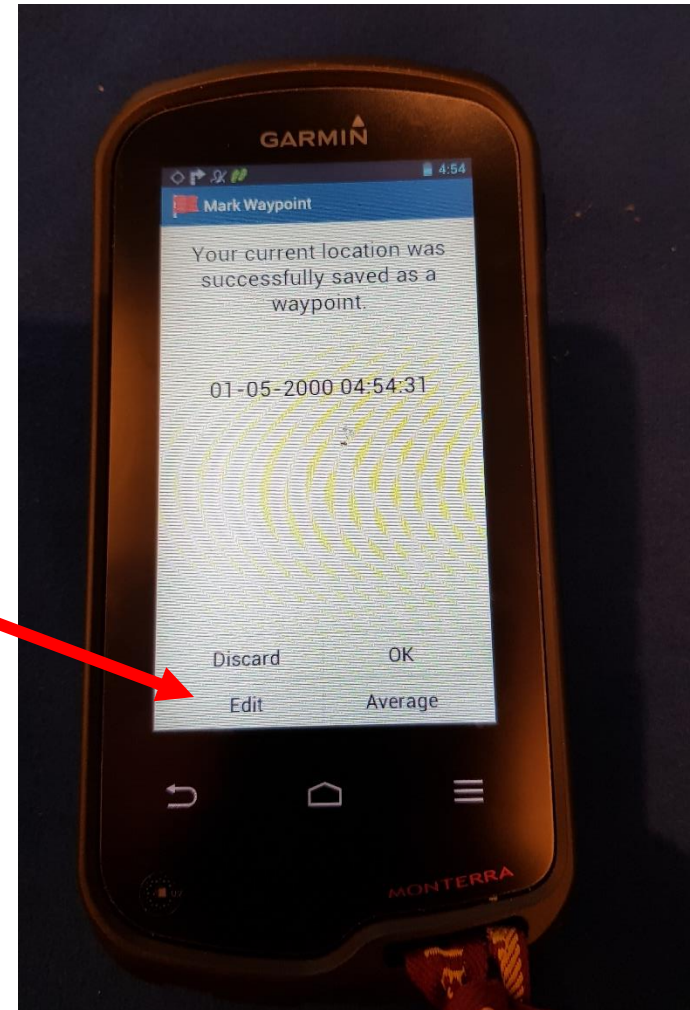
GNSS Demonstration

Garmin Monterra

- Click **Mark Waypoint**
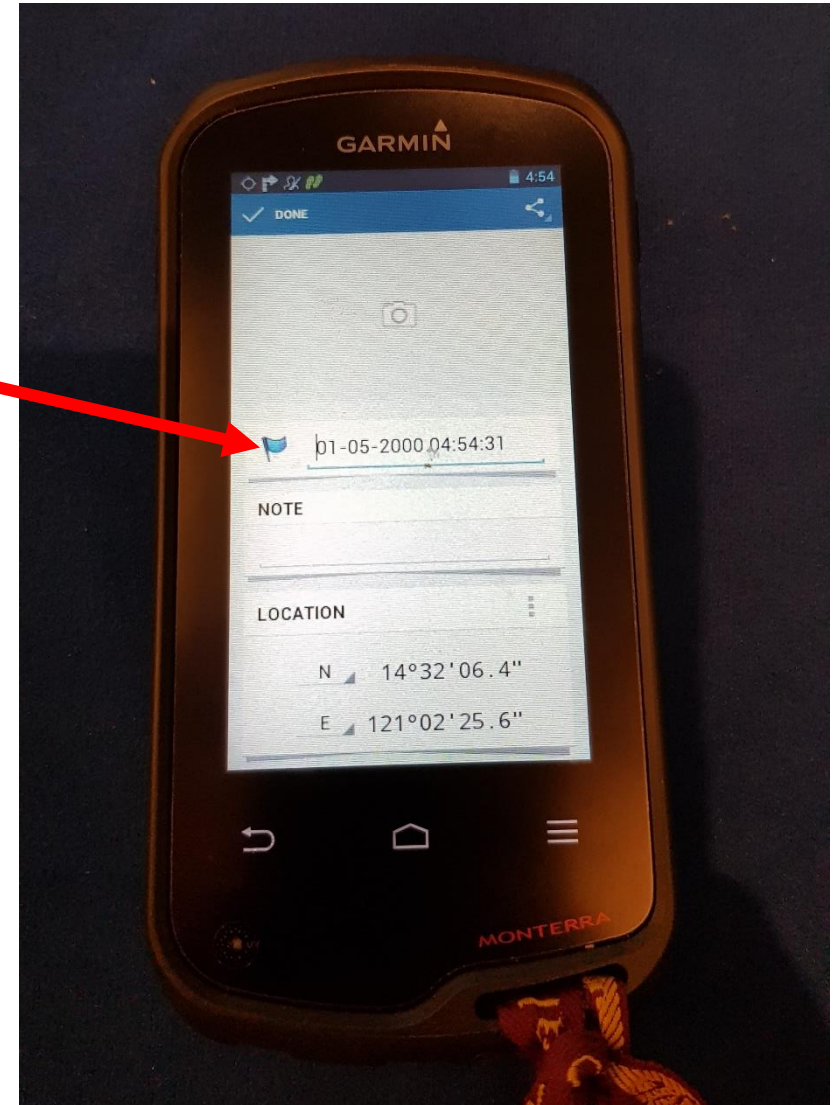
GNSS Demonstration

Garmin Monterra

- This will be the display

- If you want to edit the waypoint name, press **Edit**
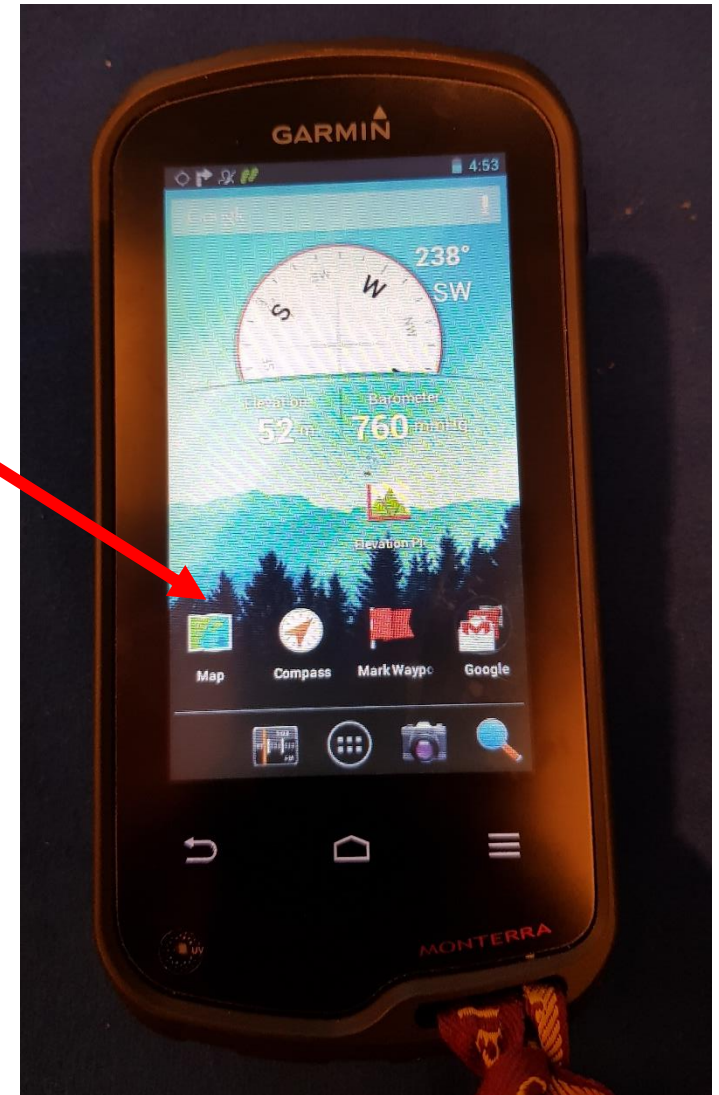
GNSS Demonstration

Garmin Monterra

- This will be the display

- Enter the name of the waypoint

GNSS Demonstration

Garmin Monterra

- If you want to display the map, press *Map*

GNSS Demonstration

Garmin Monterra

- This will be the display