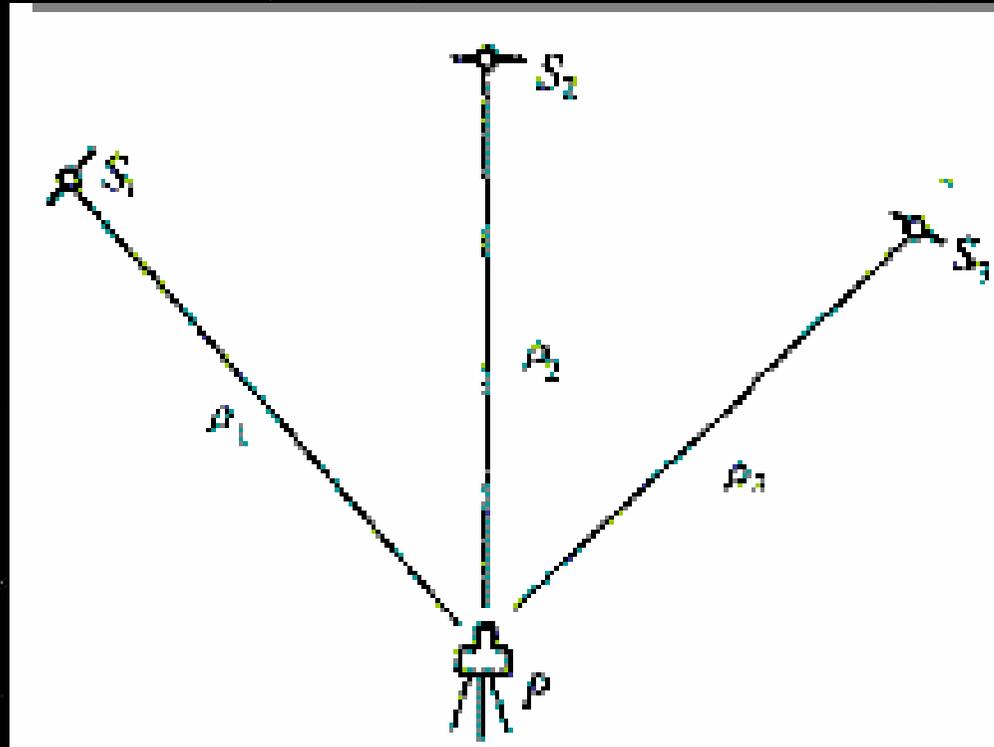# High accuracy GPS & instruments
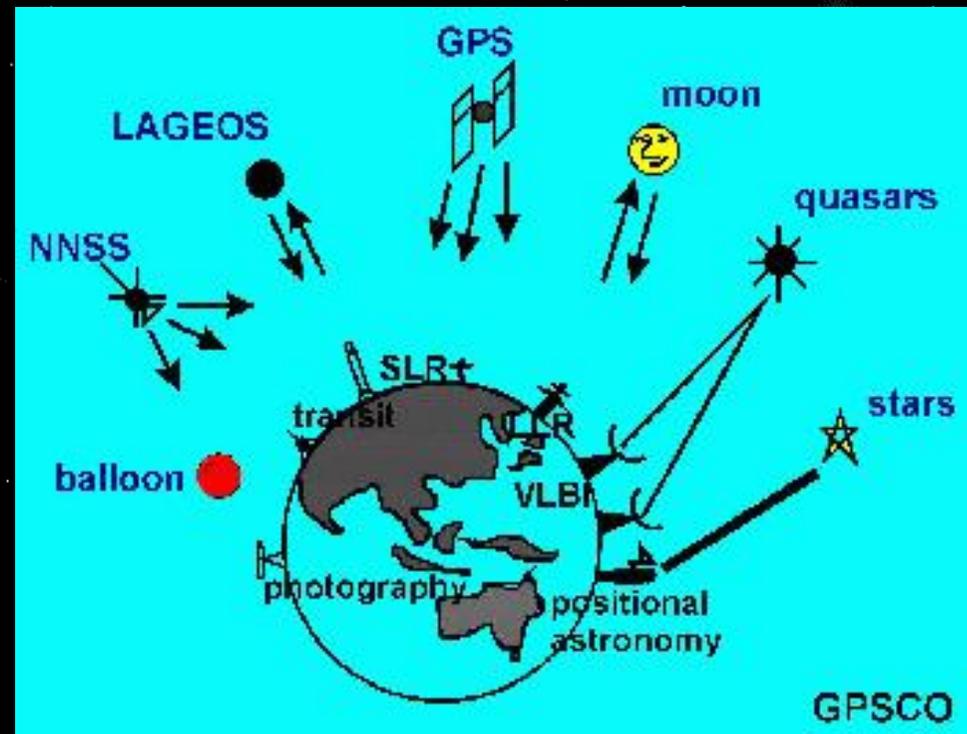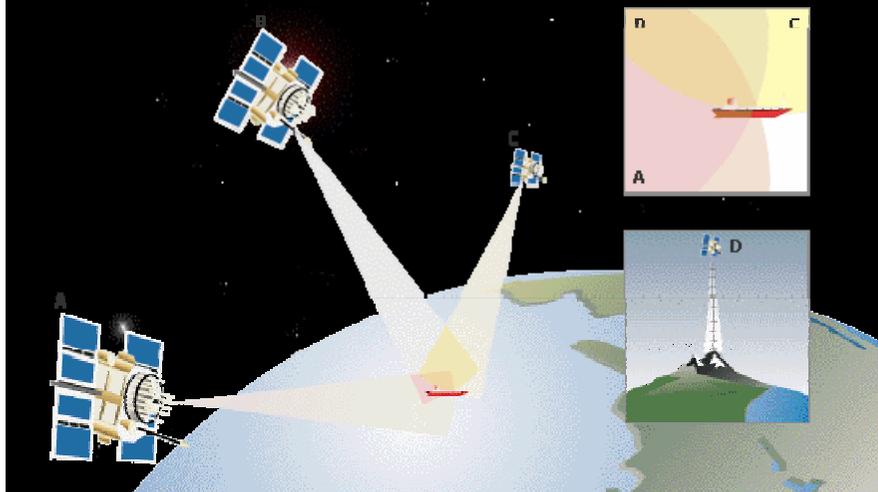
Normal position methods

$$\left.\begin{aligned}
\rho_1^2 &= (x - x_s^1)^2 + (y - y_s^1)^2 + (z - z_S^1)^2 \\
\rho_2^2 &= (x - x_s^2)^2 + (y - y_s^2)^2 + (z - z_S^2)^2 \\
\rho_3^2 &= (x - x_s^3)^2 + (y - y_s^3)^2 + (z - z_S^3)^2
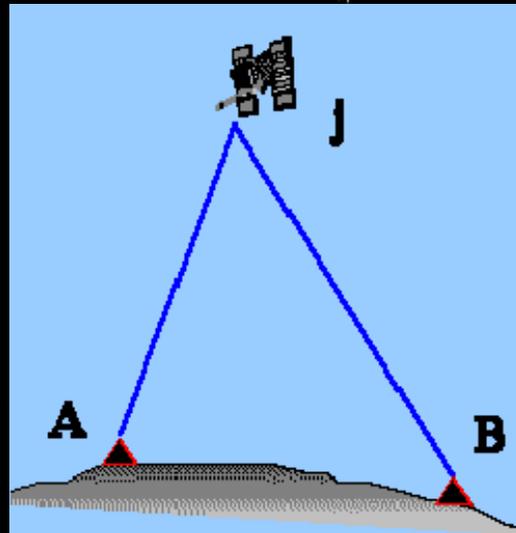\end{aligned}\right\}$$

GPS position methods

- ABSOLUTE POSITION
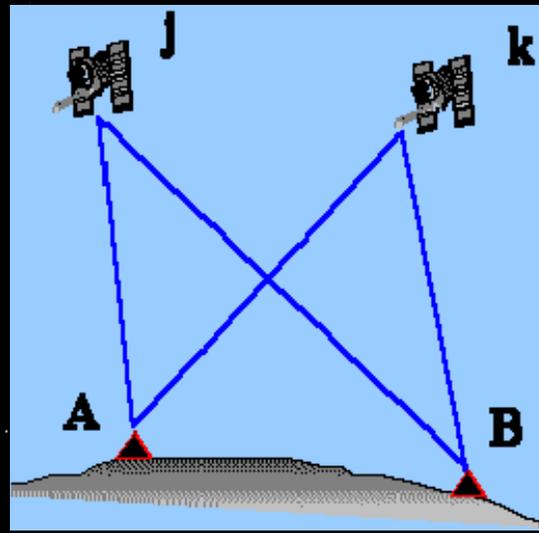- RELATIVELY POSITION
- DIFFERENTIAL POSITION

GPS Error

- Atmospheric effects
- Multipath
- Satellite geometry
- Measurement noise
- Ephemeris data
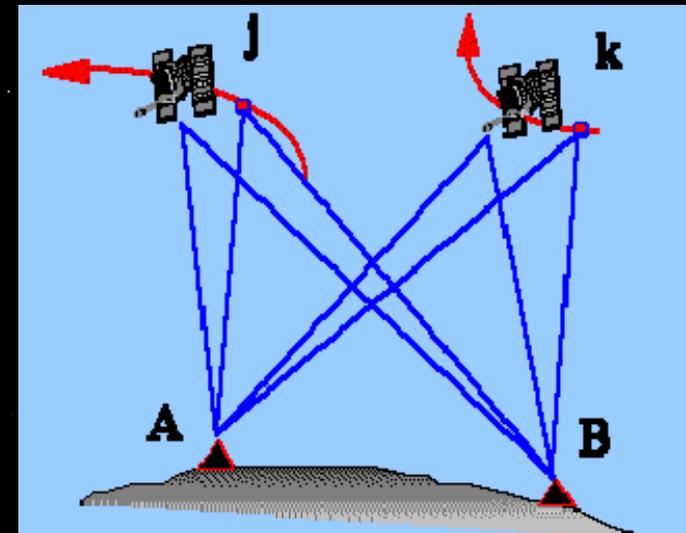- Satellite clock drift
- ~~Selective availability (SA)~~
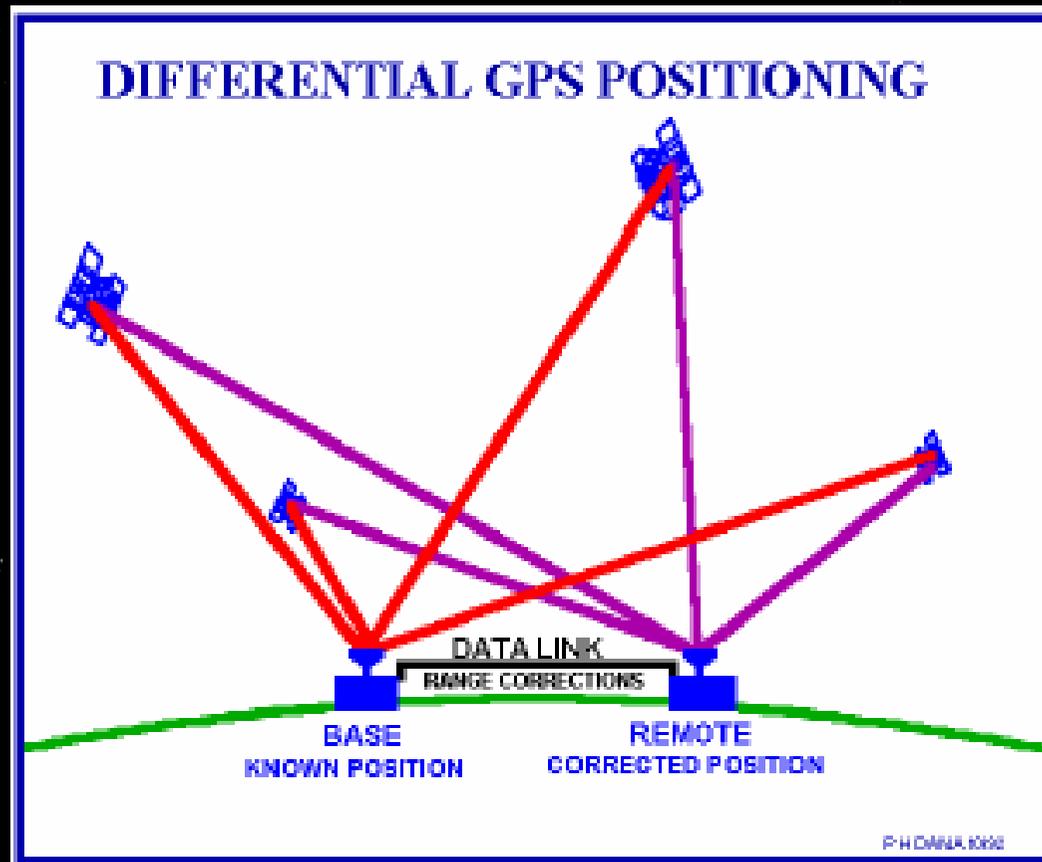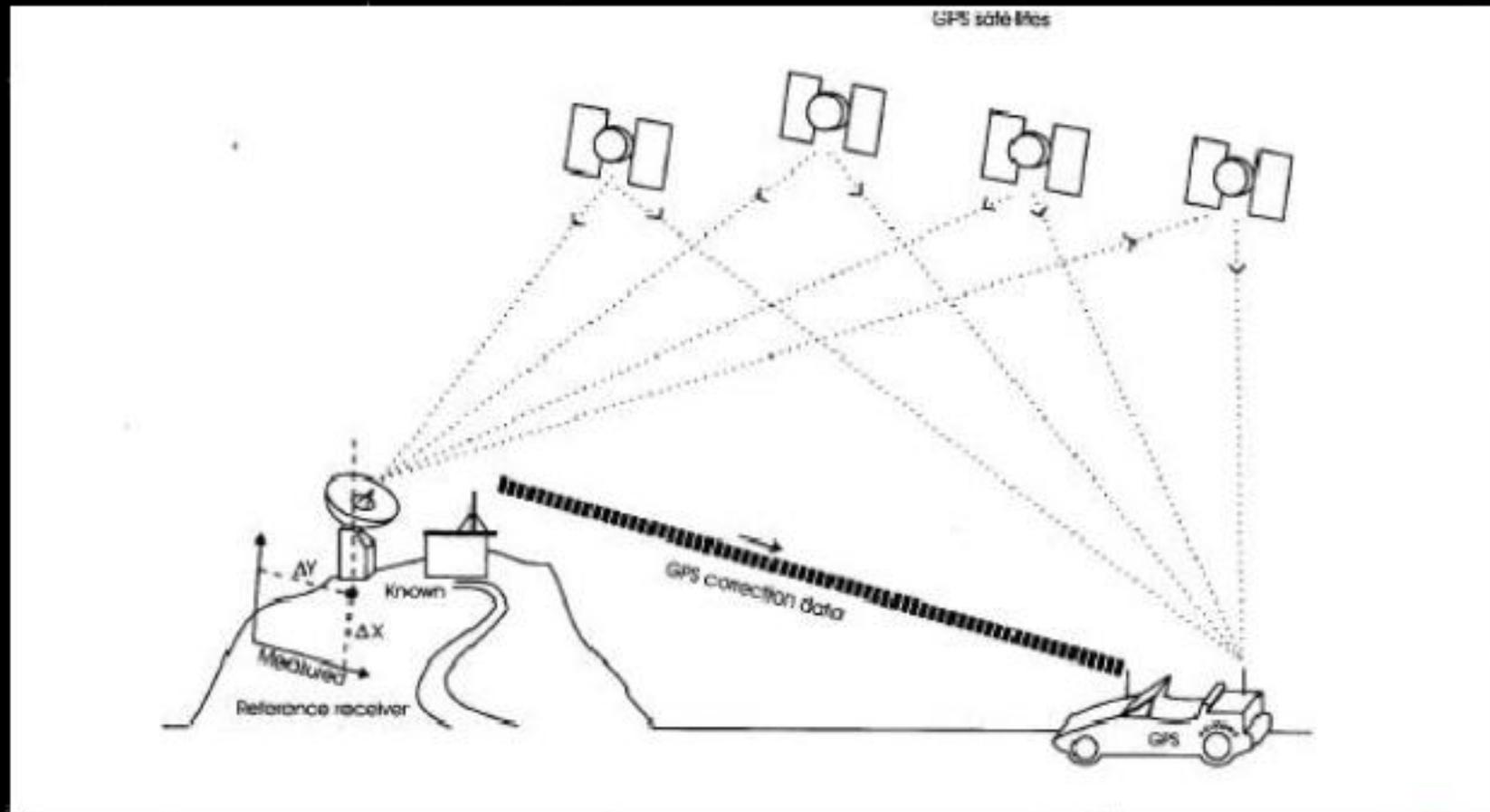
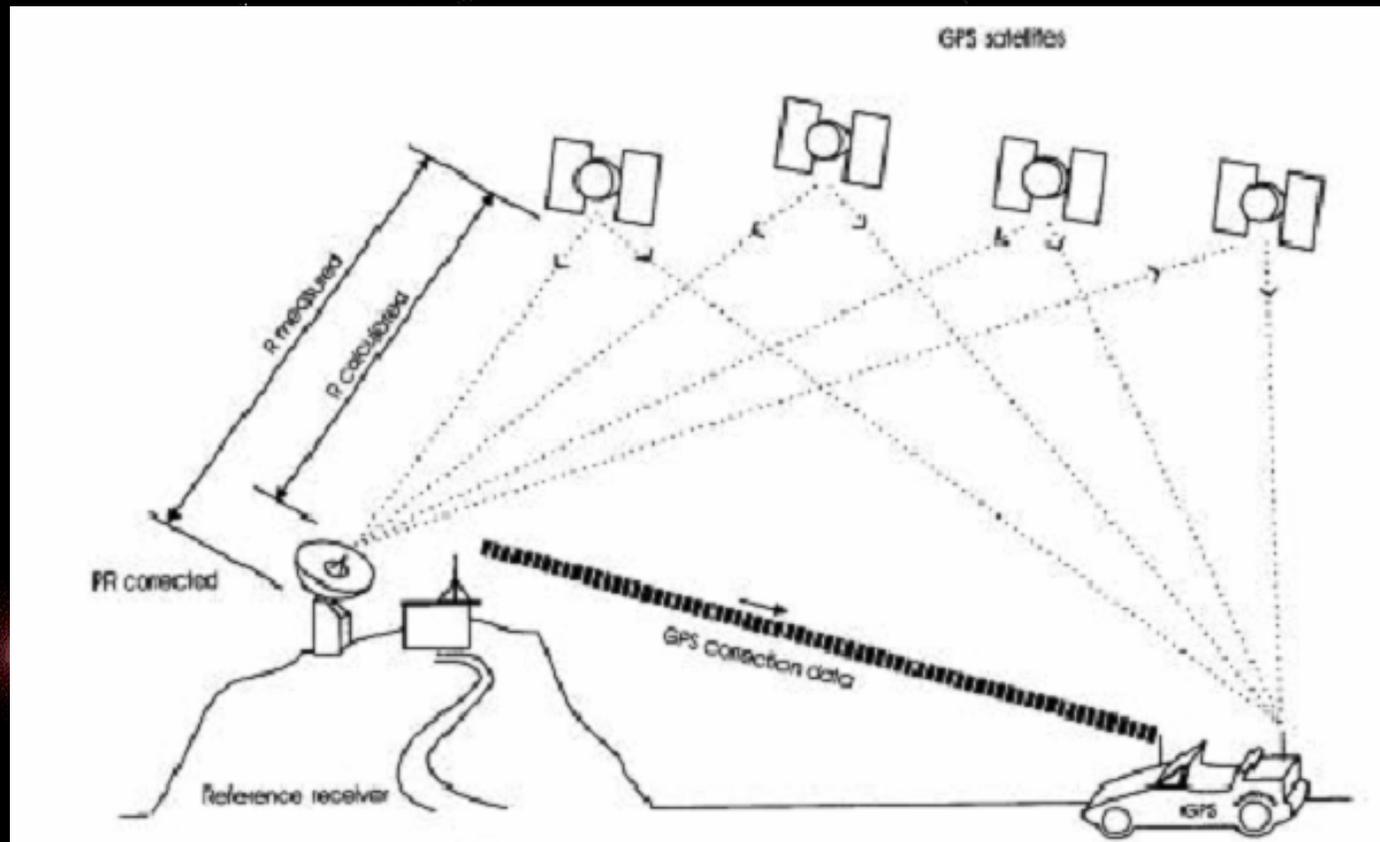# Differential GPS

Single
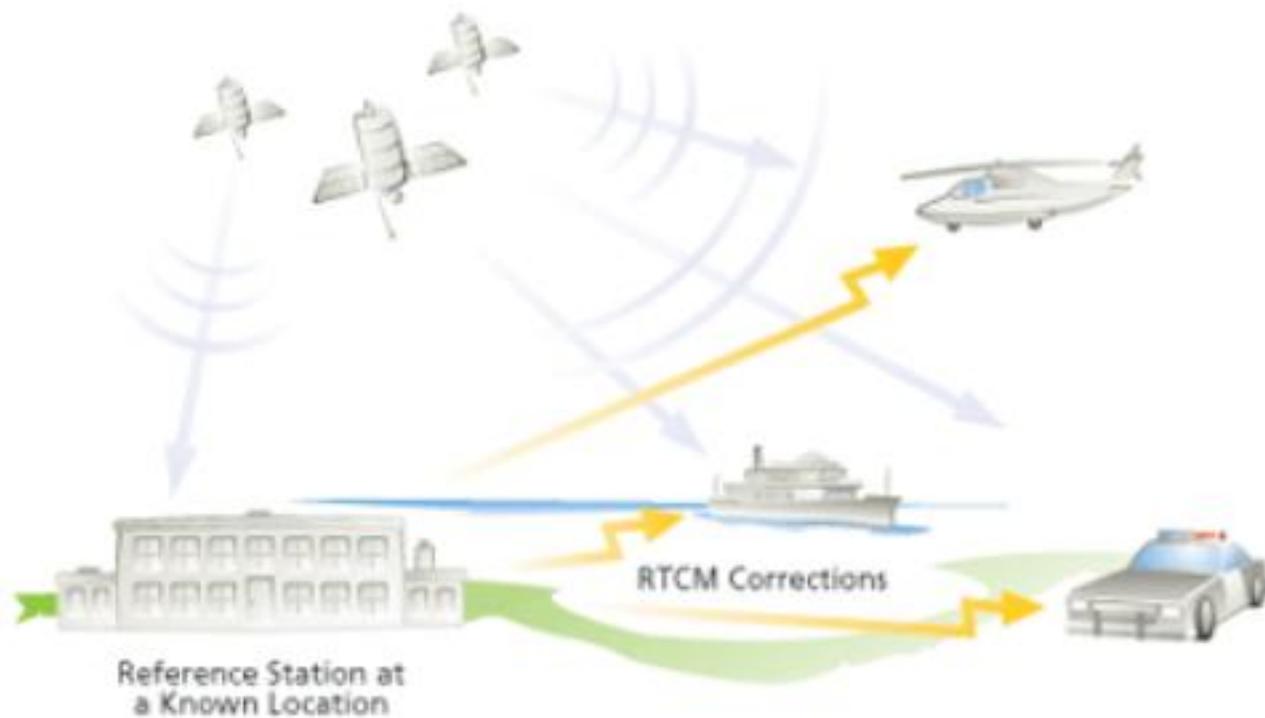
Double

Three

Differential GPS

Position difference

Pseudo-ranges difference
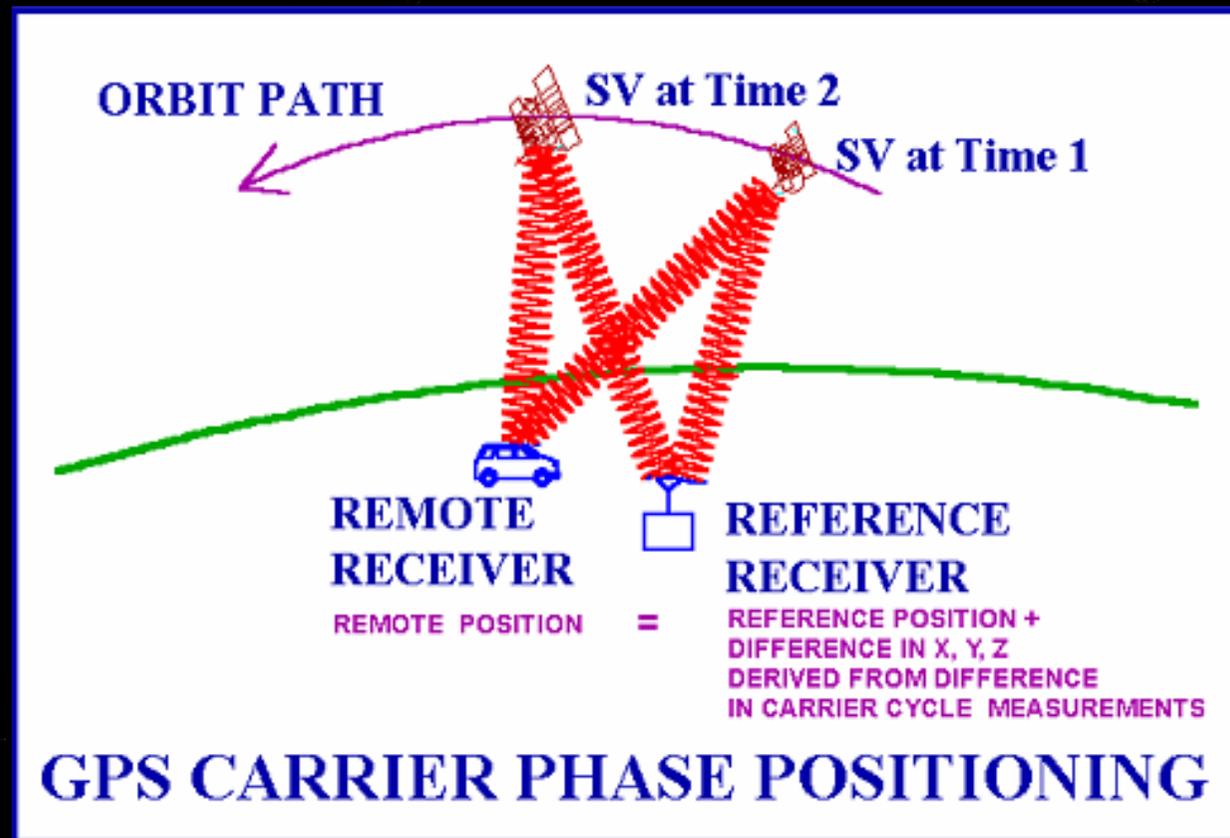
Real time DGPS

Real-Time Differential GPS

RTCM Corrections

Reference Station at
a Known Location

Differential carrier-phase positioning

Principle of RTK
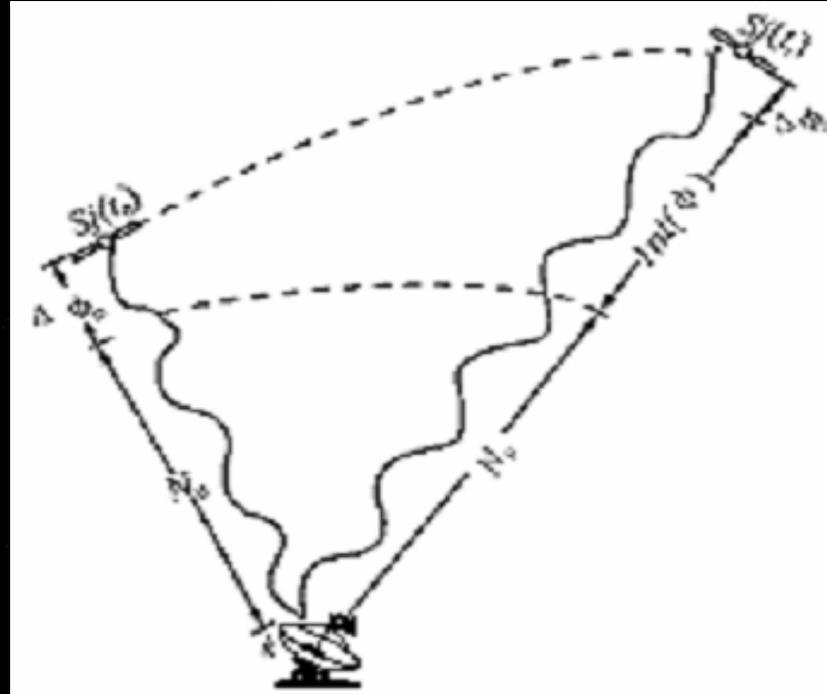
$$\Phi_k^j(t_k) = \varphi^j(t_k) + f\delta t_k - 1/c(f\rho_k^j(t_k)$$
$$- \varphi_k(t_k) + N_k^j + 1/c(f\delta\rho_1(t_k)) + 1/c(f\delta\rho_2(t_k))$$

Application of RTK

CONTROL SURVEY   MAPPING SURVEYC   ELECTRIC WIRE SURVEY

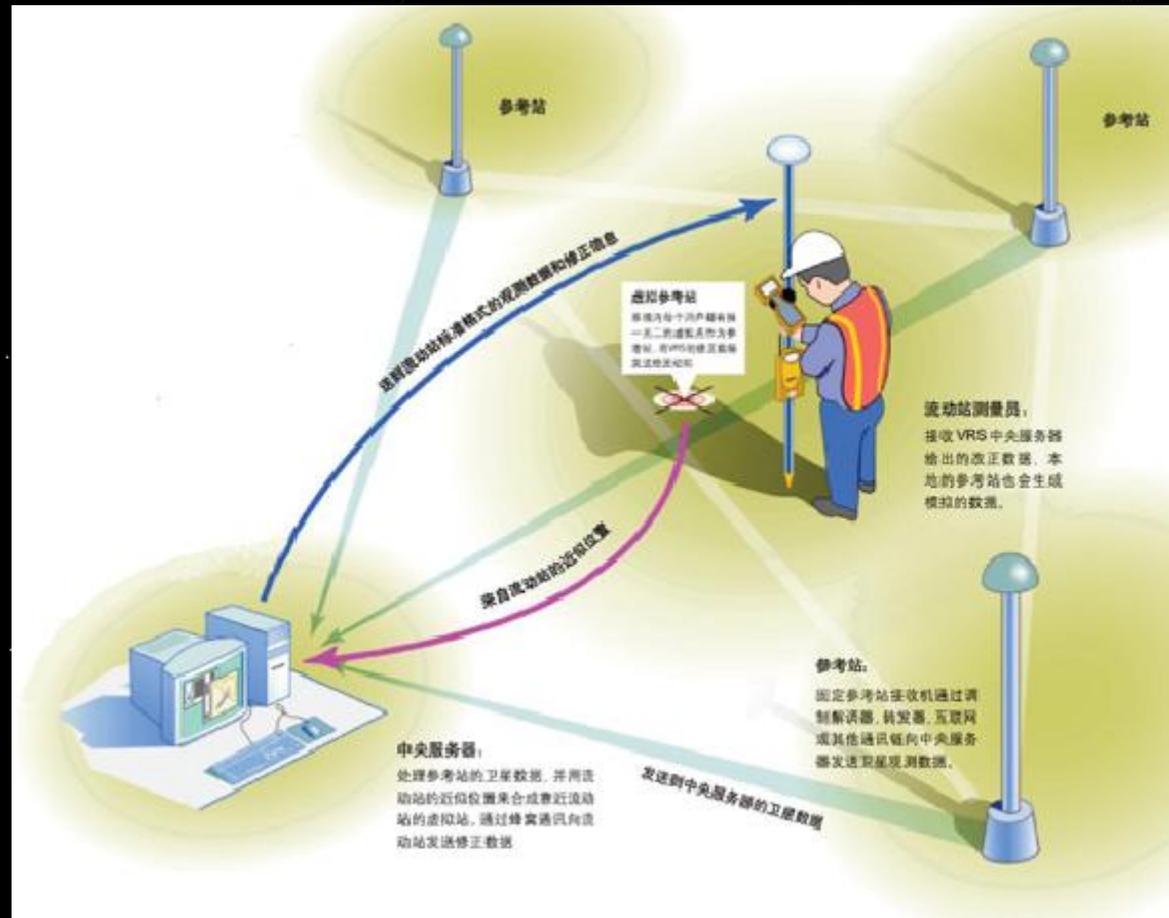# Application of RTK

Network RTK   STAKE OUT   ROAD SURVEYING

Development fashion of RTK

Development fashion of RTK

HIGH-ACCURACY INSTRUMENTS

- STAR S82 of SOUTH

- Channel: independent 24 channels

- Tracking signal: L1/L2

- Static horizontal accuracy: 5mm+1ppm

- Static vertical accuracy: 10mm+2ppm

- Static operation range: <=80km

- Static memory: inner 32M

- RTK horizontal accuracy: 2cm+1ppm

- RTK vertical accuracy: 5cm+1ppm

☻ Thank you & welcome for your question!

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