

Field Methods for High Precision GPS Measurements: lessons from 3 short-courses in Africa

D. Sarah Stamps
University of California, Los Angeles



Field Education and Support by the UNAVCO GAGE Facility Workshop
16-17 November 2014

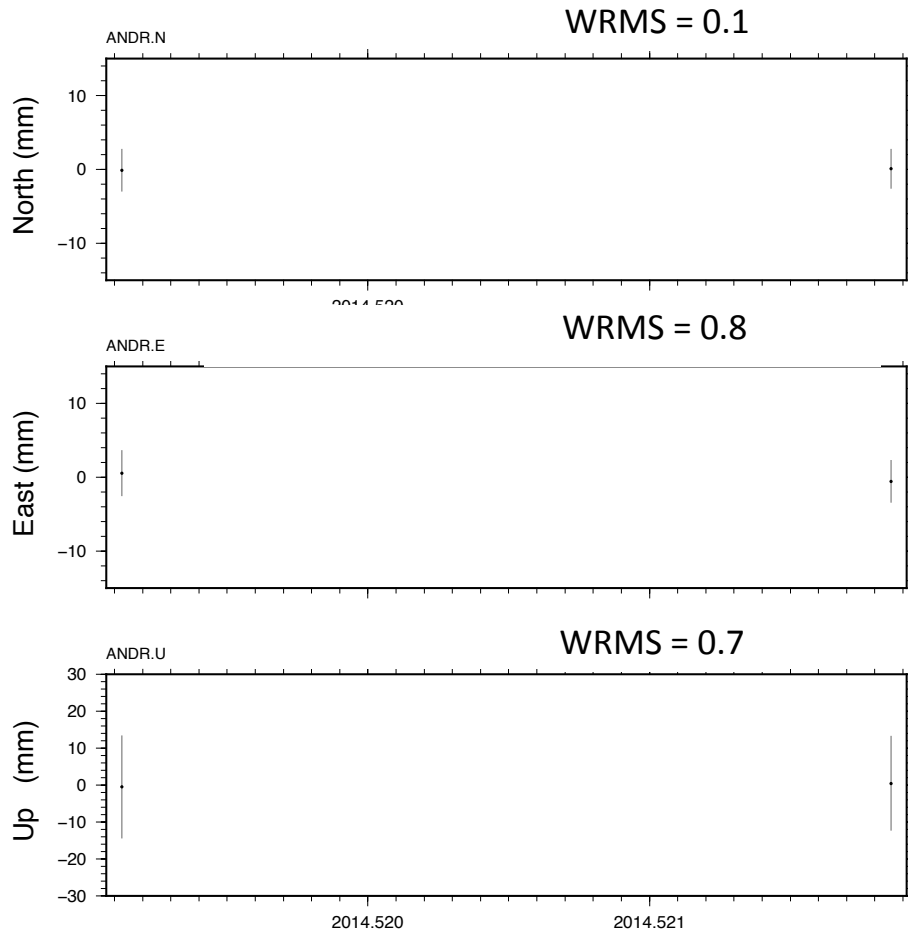


Overview

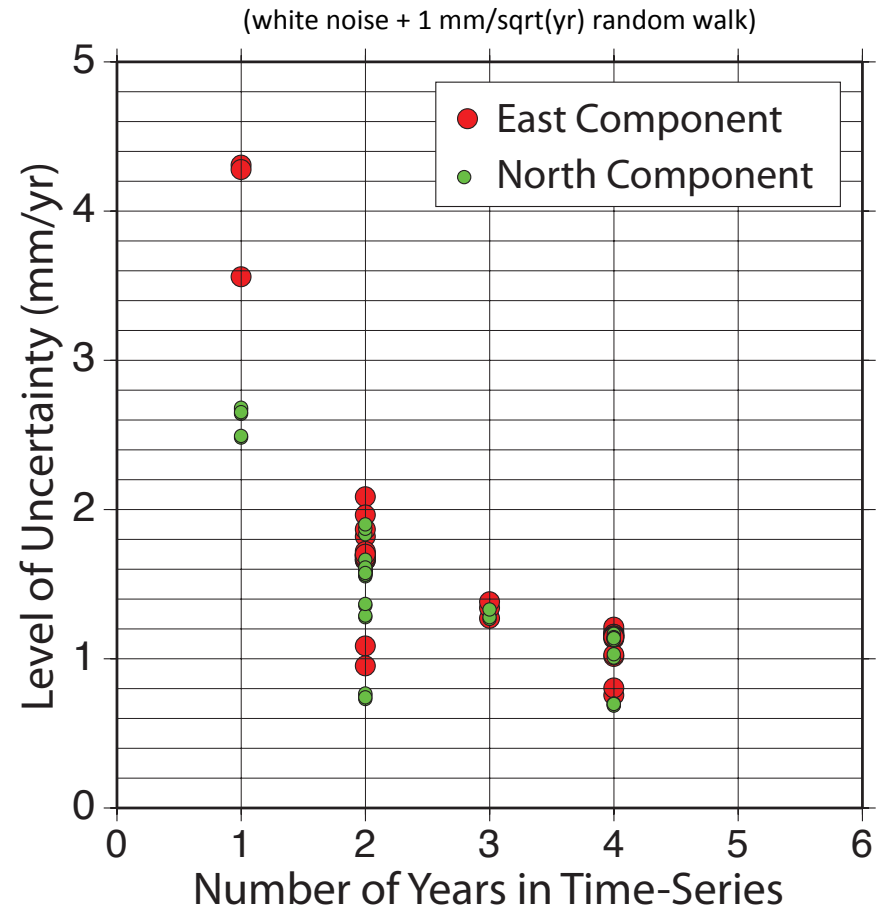
- Introduction
- Key features of the 3 short-courses
- Challenges and solutions to instrument set-up during a short-course
- Evaluations
- Lessons learned

Motivation

High precision positioning to reduce velocity uncertainties



Reduce uncertainties at each epoch
with high quality measurements



Velocity uncertainties
decrease with time

Challenges

Limited field time in remote locations

Inexperienced field operators

Need for advancing geodesy expertise of students and collaborators

Madagascar 2014																													
DATE	June/July/Aug	Fri	Sat	Sun	Mon	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su				
Name of Station	Code																												
Mampikony	MAMP																												
Anomiziana	ANOM																												
Antsiranana	ANTS																												
Antaleviana	ANTA																												
Ambia	AMBI																												
Sakaraha	SAKA																												
Mahanjava	BRCK																												
Ambohidrenfory	AMB2																												
Morondava																													
3 drills and tool kits	TEAM1																												
5 pins per team	TEAM2																												
4 GPS per team	TEAM3																												



3 short courses in Africa



Madagascar 2012

- Introduction to GPS Processing
- 1 week
- Morning lectures
- Afternoon laboratory exercises
 - UNIX basics
 - download data
 - quality check with TEQC



LONG TERM OBJECTIVE

Build Malagasy GPS group capable of conducting independent research
(per request of collaborator)

3 short courses in Africa



Democratic Rep. of Congo 2014

- GPS Geodesy and Applications in Geodynamics
- 3 days
- Morning lectures
- Afternoon laboratory group exercises
 - Reading and interpreting time-series
 - GPS campaign station set-up
 - Download GPS data

LONG TERM OBJECTIVE

Advance participants' understanding of geodesy tools and applications and prepare for field studies.
(course in GEORISCA program)

3 short courses in Africa



Madagascar 2014

- Introduction to GPS Geodesy and High Precision Positioning
- 1 week
- Morning lectures
- Afternoon laboratory exercises
 - Practice and understand GPS station set-up
 - UNIX basics
 - quality check with TEQC
 - process data for precise positions using GAMIT

LONG TERM OBJECTIVE

Build Malagasy GPS group capable of conducting independent research and introduce subject to broader audience

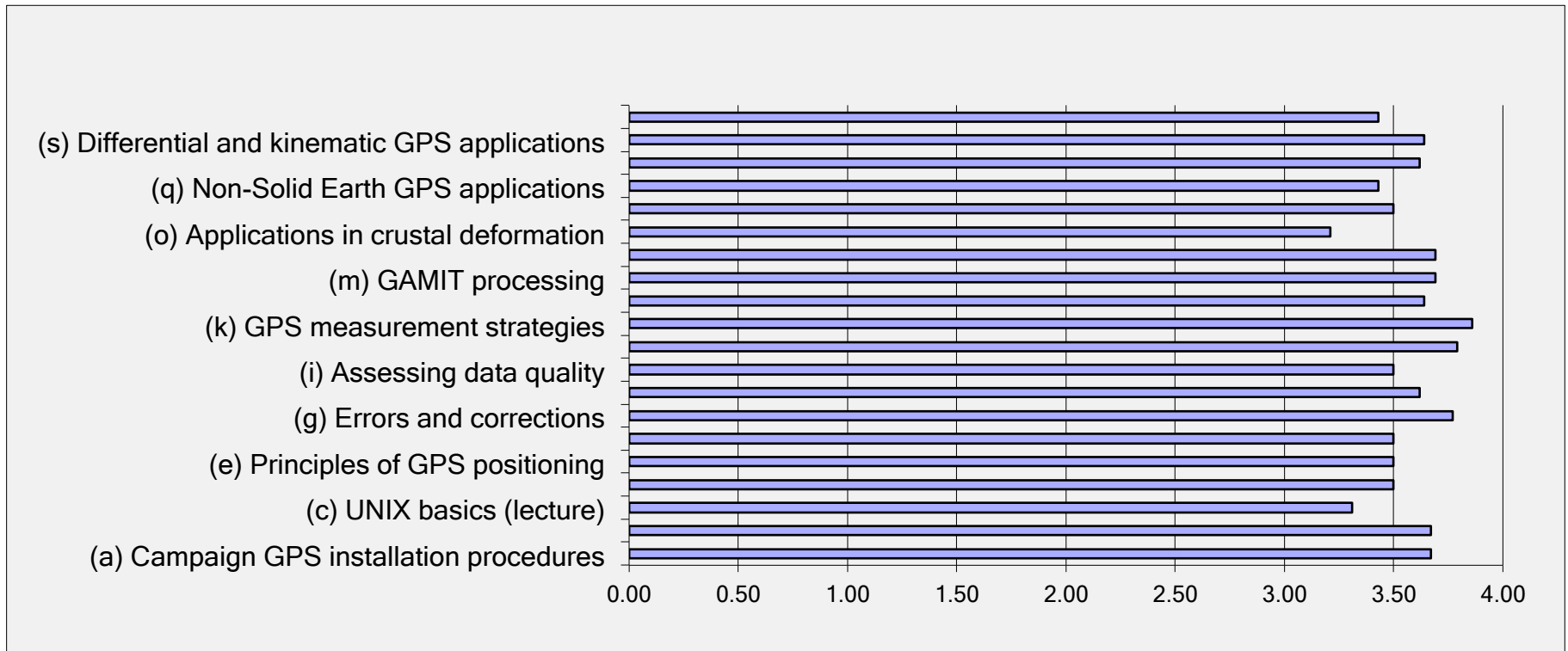
Overview

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- **Key features of the 3 short-courses**
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Lectures tailored for the audience

First exposure to GPS geodesy?

How much background material is necessary?



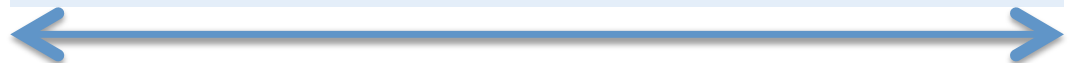
UNAVCO ECE compiled survey results from 2014 Madagascar short-course

Not needed, should be omitted

Less helpful, could be removed

Useful, consider keeping

Critical, must be retained



Towards high quality GPS measurements



1. Taught concepts in a lecture setting
2. Introduced equipment in the classroom
3. Practiced outside:
 - walked around to groups providing guidance
 - asked questions about the quality of their environment
 - 2 complete set-ups



Overview

- Introduction
- Key features of the 3 short-courses
- **Challenges and solutions to instrument set-up during a short-course**
- Evaluations
- Conclusions and future directions

Challenges

equipment : participant

environment for practicing set-up

group dynamics

Solutions

equipment : participant

had students rotate jobs

(recording information on logsheets, leveling, solar panel set-up, etc.)

environment for practicing set-up

emphasized in lecture best locations

quizzed and/or guided participants during set-up

group dynamics

created a fun environment in the classroom

informed participants about teamwork

Overview

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- **Evaluations**
- Lessons learned

Using evaluations to improve short-course

Were there particular topics in the course that you would have liked to have more information about?

I was able to understand Dr. Stamps' explanations of material.

Please provide any other feedback you think will be valuable in improving the course. (For example, related to course content, structure, and/or instructor interaction, other)

I think this course would be more effective with more instructors.

Worked with UNAVCO ECE to develop and distribute survey.
UNAVCO compiled data.

Overview

- Introduction
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- Evaluations
- **Lessons learned**

Lessons learned

Participants appreciated most the lecture “GPS Measurement Strategies”

Most used or will use lecture materials and hand-outs.

20 participant class appreciated 3 instructors during laboratory exercises.

A translator helps and is most useful if they had a technical background.

Had to manage issues related to equipment: participant ratio, environment conditions for teaching outside, and group dynamics.

Evaluations are valuable for improvement the effectiveness of the courses.

Allow room for modifying end of week lectures to accommodate participate requests.