SENSING PROGRESS

Space Solutions for Climate Change & Food Security

"Future Trends"

United Nations/Austria Symposium on
Integrated Space Technology Applications for Climate Change
Graz, Austria 12 – 14 September 2016

CELEBRATING 25 YEARS

University of South Australia

INTERNATIONAL® SPACE UNIVERSITY

Sensing Progress

- This white paper was written during the 2016 ISU Southern Hemisphere Space Studies Programme.
- 31 participants took part in a five week programme which culminated in the delivery of this report.
- Researched and delivered recommendations on the use of space solutions to help solve problems related to food and water security.

Climate Change and Food Security

- Noticed strong links between climate change and food security.
- This link is becoming more apparent – unpredictable weather patterns affect crop yields.
- Flooding and drought also more prevalent due to rising global temperatures.
- Benefits of this overlap include a larger dataset (e.g. crops can be observed from space and indicate local levels of CO_2, other pollutants) as well as a more sympathetic public perspective.

White Paper in Brief

- When writing, we examined in detail 3 key factors: urbanization and population, climate change, and flood and drought.
- Included case studies of existing remote sensing capabilities throughout the global south.
- Also explored various concepts which could be used to address issues surrounding food and water security, including construction of a stratospheric balloon payload to remotely image crops and development of user-to-user networks to spread information.
- White paper culminated with three key recommendations.

Recommendations

- International Data Sharing:

"We recommend the open and timely sharing of Earth observation data, experience and other information resources among nations and peoples."

- Capacity Building:

"Governments in the Global South should invest in capacity building by funding Earth observation and remote sensing education and outreach programs."

- Expansion of Current Schemes:

"Expand current Earth observation programs by establishing multisectoral policies and programs focused on strengthening food and water security within States where such schemes are already prevalent, and to States where such schemes would greatly improve the quality of life."

Preliminary Solutions

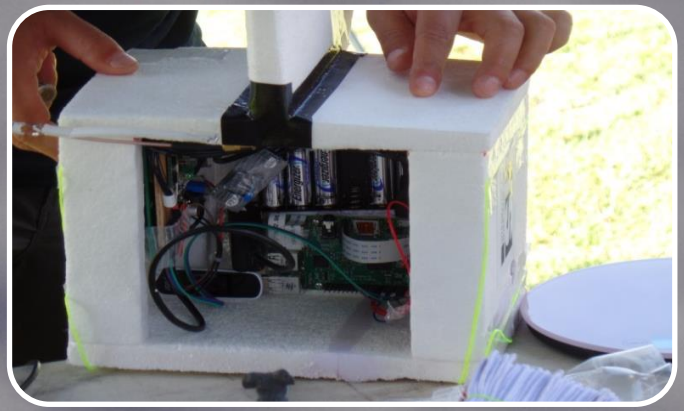
- Constructed a stratospheric balloon payload designed to image crops in the visible and near infrared parts of the spectrum.
- Demonstrated that remote sensing technology can be made cheaply and easily, but does require some education – and thus further capacity building.
- Also envisioned a mobile application or SMS based service – 'The H-app-Y Farmer' – that could transmit relevant information such as long term (6-12 month) rainfall predictions or soil composition based on historical data.
- Again, this requires improved data and personnel sharing – especially for countries without access to satellite technology.

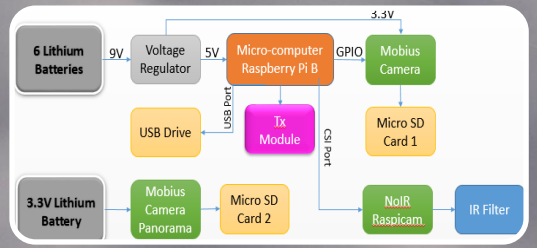
Universities and schools project

Sensitize the new generations and the public to the problem with teaching experiments.

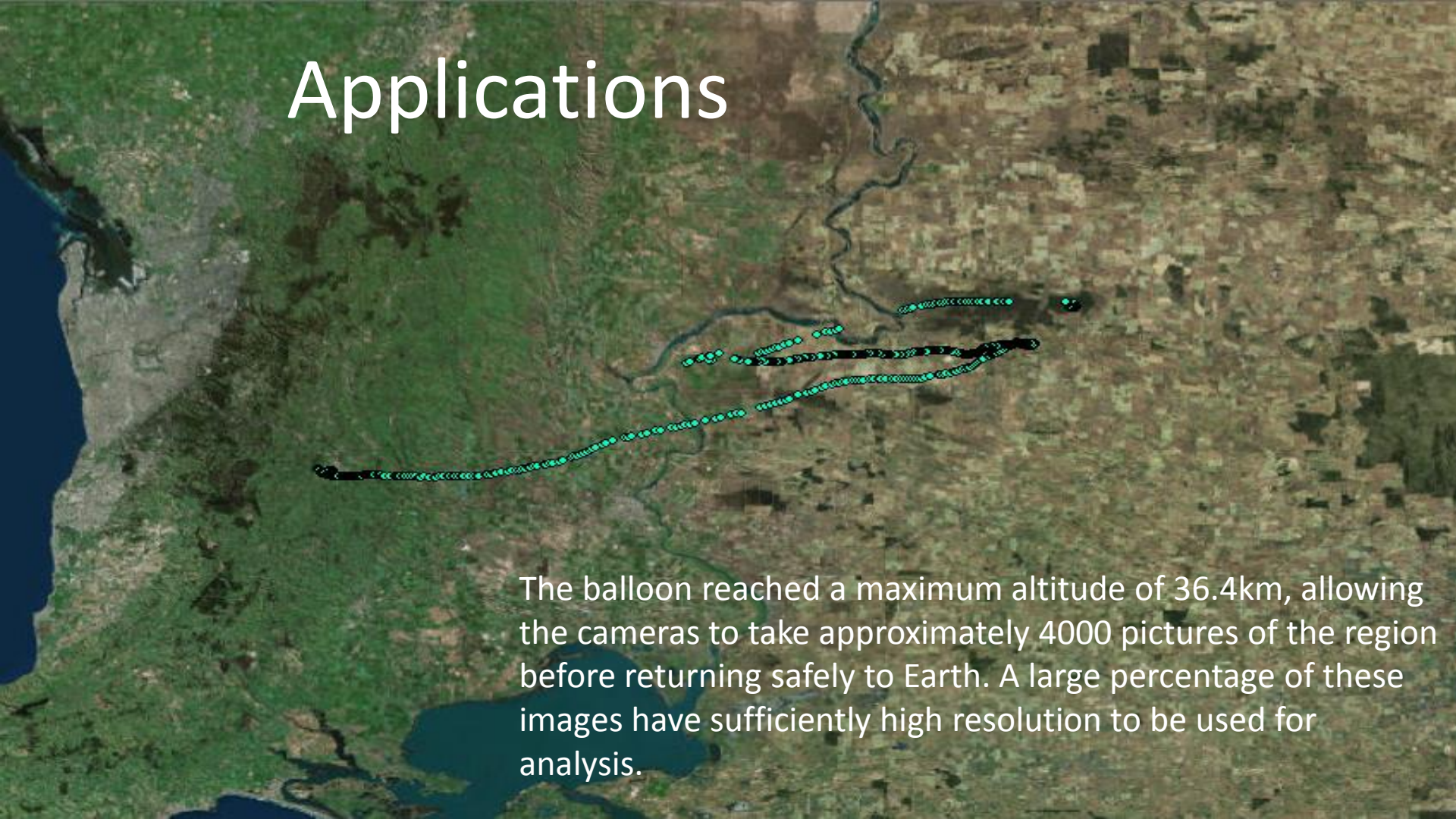
Pratical example for universities: Stratospheric Balloon

A balloon is a cheap, robust option that is easier to understand and implement. The area around the Mount Barker township in South Australia was successfully recorded.



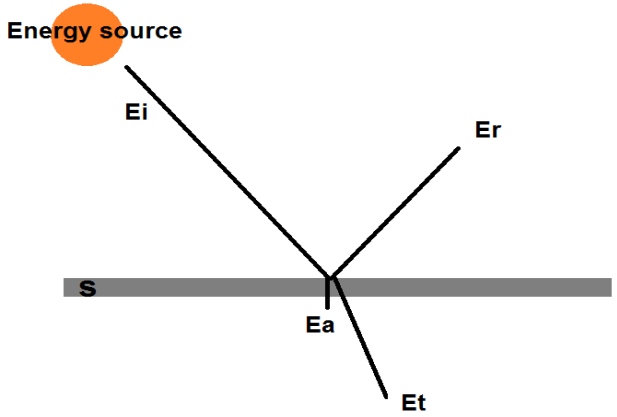


Applications

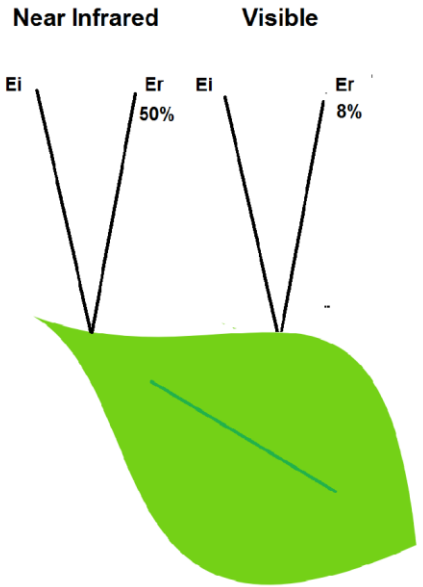


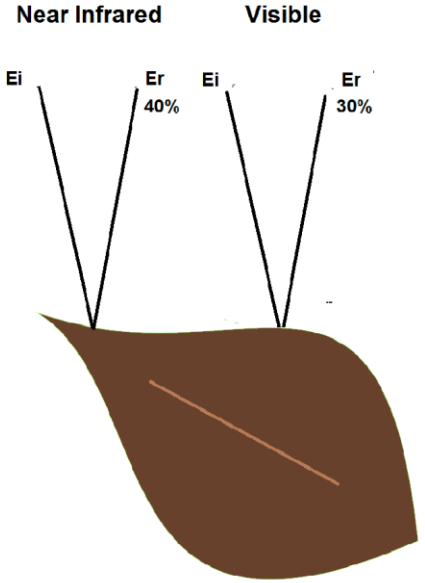
The balloon reached a maximum altitude of 36.4km, allowing the cameras to take approximately 4000 pictures of the region before returning safely to Earth. A large percentage of these images have sufficiently high resolution to be used for analysis.

Remote sensing and the NDVI



With visible images and the near-infrared images, it is possible to calculate the **Normalized Difference Vegetation Index** (NDVI), an indicator that describes 'the greenness' or photosynthetic activity of plants (the relative density and health of vegetation).

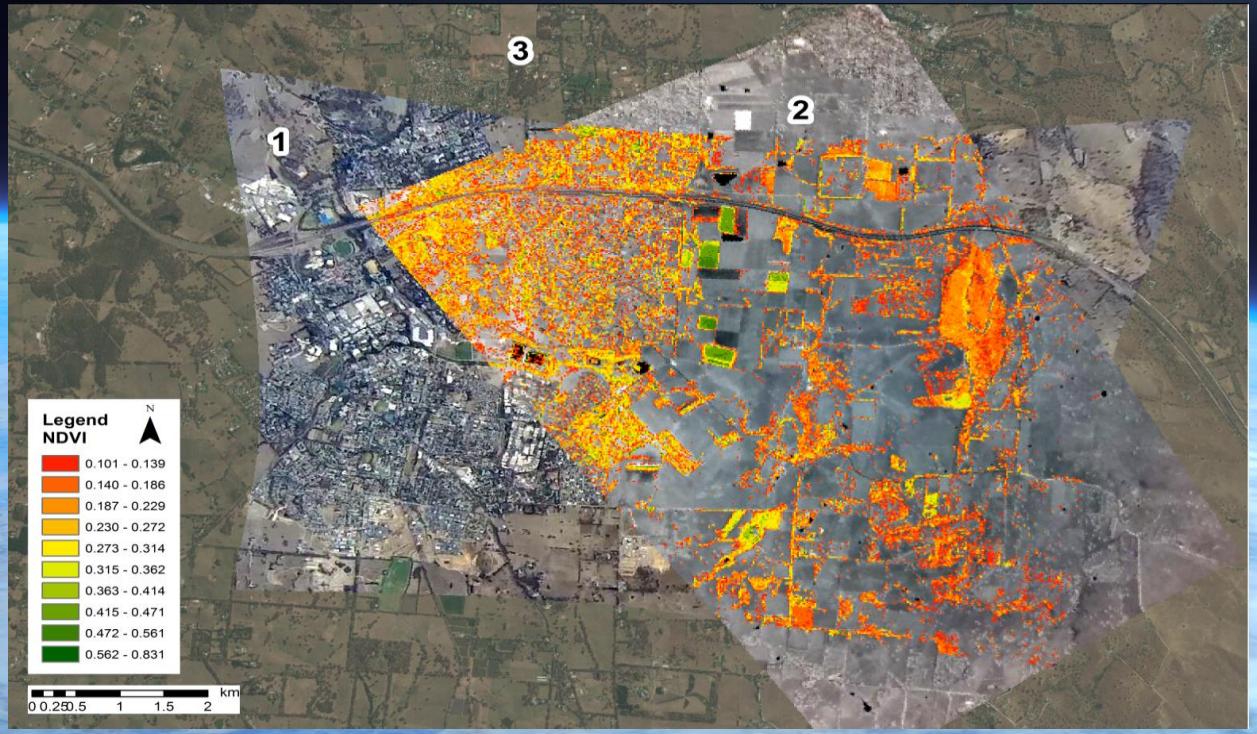




The NDVI is described as follows:
NDVI= ((Nir - R)/ (Nir + R))

NDVI values range from +1.0 to -1.0.

Results and Analysis

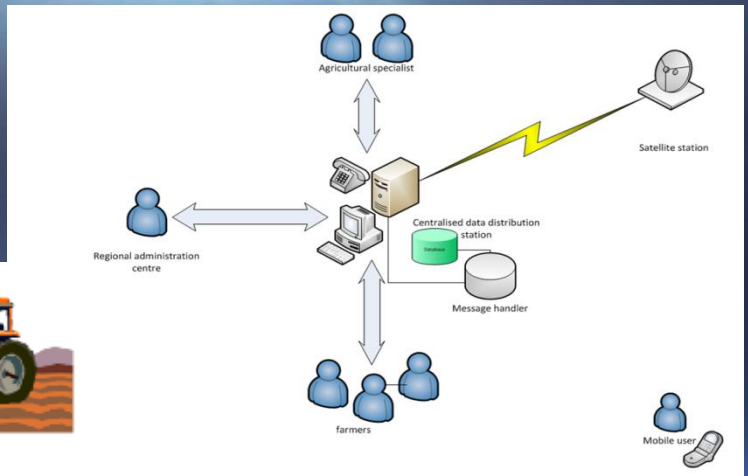


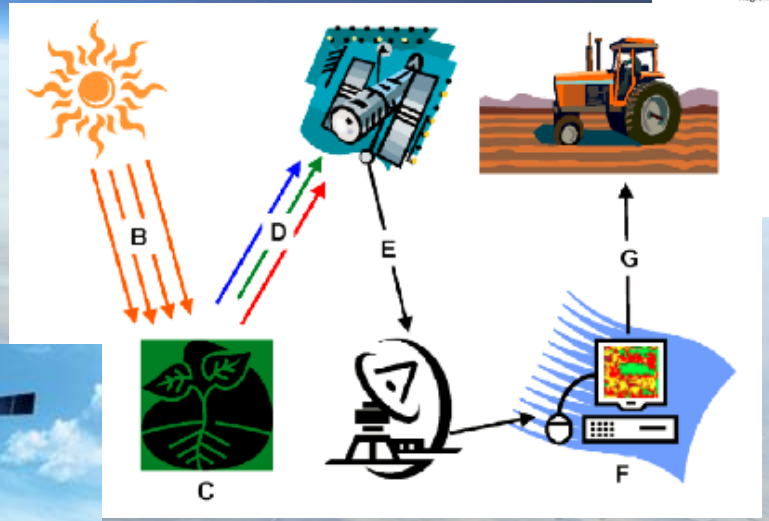
For more information see the poster:

Southern Hemisphere Space Studies Program (2016) Stratospheric Satellite Project: The Water and Food Security in Relation to Climate Change

Smart Farming

Recommendation 1:
International Data Sharing





-Maps of health states for crops

-Autonomous guiding for farming vehicles

HappY Farmers solution

Recommendation 2:
Capacity Building

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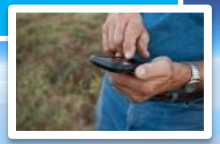
Capacity Building

HappY Farmers solution

Farmers



people to people
communication

IT Software Solutions

International
Farmers
Data Centre

Data Communication

Internet Access

TIGER AFRICA

SABER

UNOOSA

Australian Government
Australian Centre for International Agricultural Research

RIICE

CSIRO

National Farmers' Federation

crectealc

FEWS NET
FAMINE EARLY WARNING SYSTEMS NETWORK

Australian Government
Department of Agriculture and Water Resources

AG INSTITUTE

RURAL INDUSTRIES
Research & Development Corporation

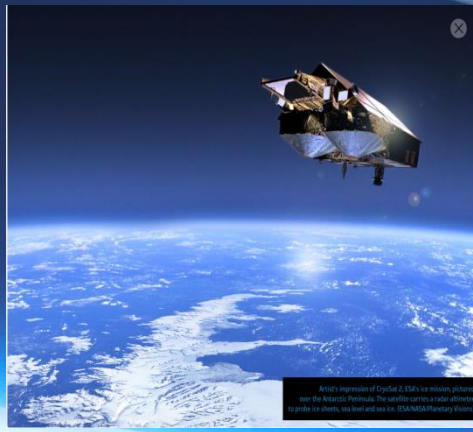
Aussie Farmers Direct

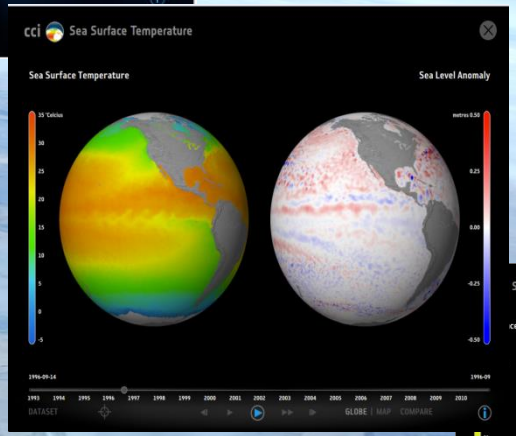
Future Trends:

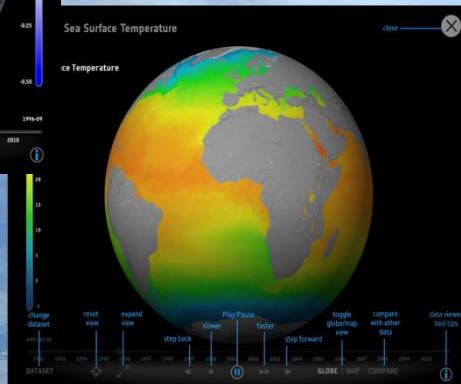
“Apps”

ESA

CLIMATE FROM SPACE



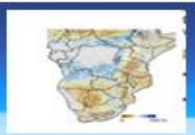




TIGER

Geology and Ground Water

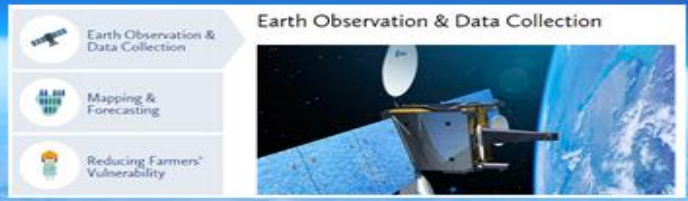
Soil Moisture



Surface Water and Flood

Lake Surface Temperature

RIICE



Allianz

giz

IRRI

sarmap

Crectealc

SRE

INAOE

SMN

Fews Net

FEWS NET
FAMINE EARLY WARNING SYSTEMS NETWORK

- Food Assistance Needs
- Food Prices
- Weather Hazards
- Climate Change
- Ebola Coverage
- El Niño

USAID
Kimetrica
NASA
USDA
USGS

International Cooperation

Further Steps

- ‘Sensing Progress’ identifies three key areas that need improvement – data sharing, capacity building and expansion of current Earth observation schemes
- We further propose the creation of two pilot schemes that allow new methods of data sharing and capacity building to be tested, with specific regards to the concepts discussed in this presentation.
- Both of these ideas lend themselves to cooperation with other groups that are engaged in improving engineering capacity in the developing world, such as Engineers Without Borders.
- Creating pilot schemes would also allow opportunities to find further synergies when using space technology to address both climate change and food security.

Conclusion

If you are interested, ‘Sensing Progress’ is available for download at

http://www.shssp.education/2016/whitepaper/index.php

Thank you for your attention.

We would be happy to answer any questions you may have.

UN/Austria Symposium
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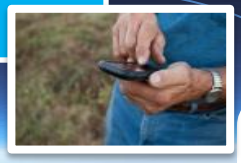
HappY Farmers solution

Farmers



people to people
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International
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Data
Communication

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Access