Living in a land prone to fire: supporting early response, and the coordination of firefighting assets, across a continent

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Problem

A key lesson learnt from the fire management community is that the earlier an appropriate fire response can be mounted the better; resulting in significant community benefits. However, it can be hard to monitor a country as large as Australia and to detect fires, particularly in vast and remote areas where fire ground intelligence is not easily available.

Satellite Earth Observation Data Application

The Sentinel Hotspots monitoring system provides an important and consistent overview for management of fires across the country. The system was developed in the early 2000's through a collaborative effort between Geoscience Australia, Australian Geospatial-Intelligence Organisation and CSIRO Land and Water. The system monitors hotspots nationally and provides timely hotspots information to its end-users.

Sentinel has been a valuable input into the tools used by government and private agencies managing fires in Australia. A number of land management and emergency response agencies have taken data feeds from the Sentinel system to imbed into their routine fire management operations enhancing their situational awareness programs to assist staff, managers and the community. Hotspots data when merged with other spatial information provide a strategic picture to land managers; which allows them to understand the implications of a particular fire as well as to target resources.

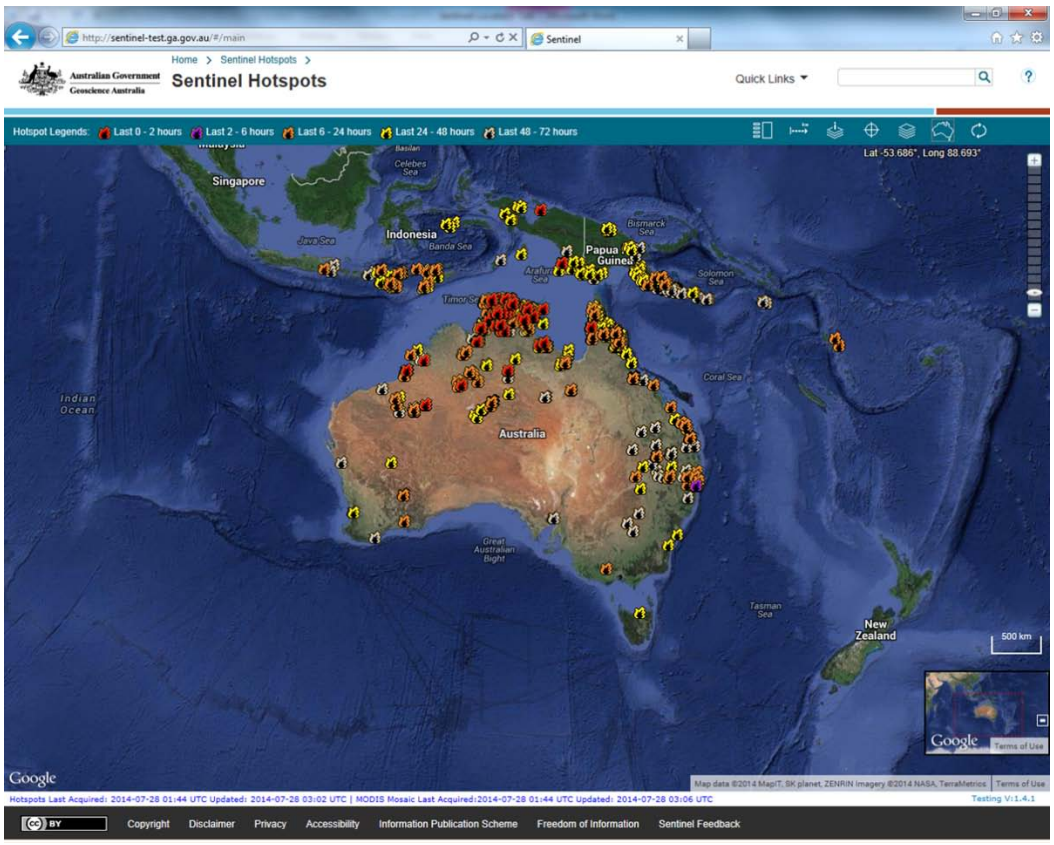


Figure 1: The Sentinel Hotspots website, showing the location of hotspots anomalies that may be fires across Australia and nearby countries.

In addition to displaying hotspots, the Sentinel Hotspots system provides additional products through the online interface, such as visualization and download of current and archived hotspots data to help understand previous fire behaviour, and detailed information of the detected hotspots from fire intensity and power measurements. The functionality of Sentinel was developed in consultation with stakeholders to ensure a close alignment between end-users needs and the provided services.

Australians from all walks of life use Sentinel with millions of web-site hits during summer. The public use sentinel to understand if major fires are near to them, their friends or loved ones. Emergency managers use sentinel to inform broad situational awareness during the fire season. During the 2009 Black Saturday event, USA firefighters used Sentinel hotspots information to get a high level overview on the location of wildfires in Victoria. Sentinel hotspot data is openly available to the government, academics and researchers, private industry and to the general public. One private company for instance, Indji Systems, uses Sentinel hotspots information to create value added products to issue warnings when fires approach assets such as power-lines.

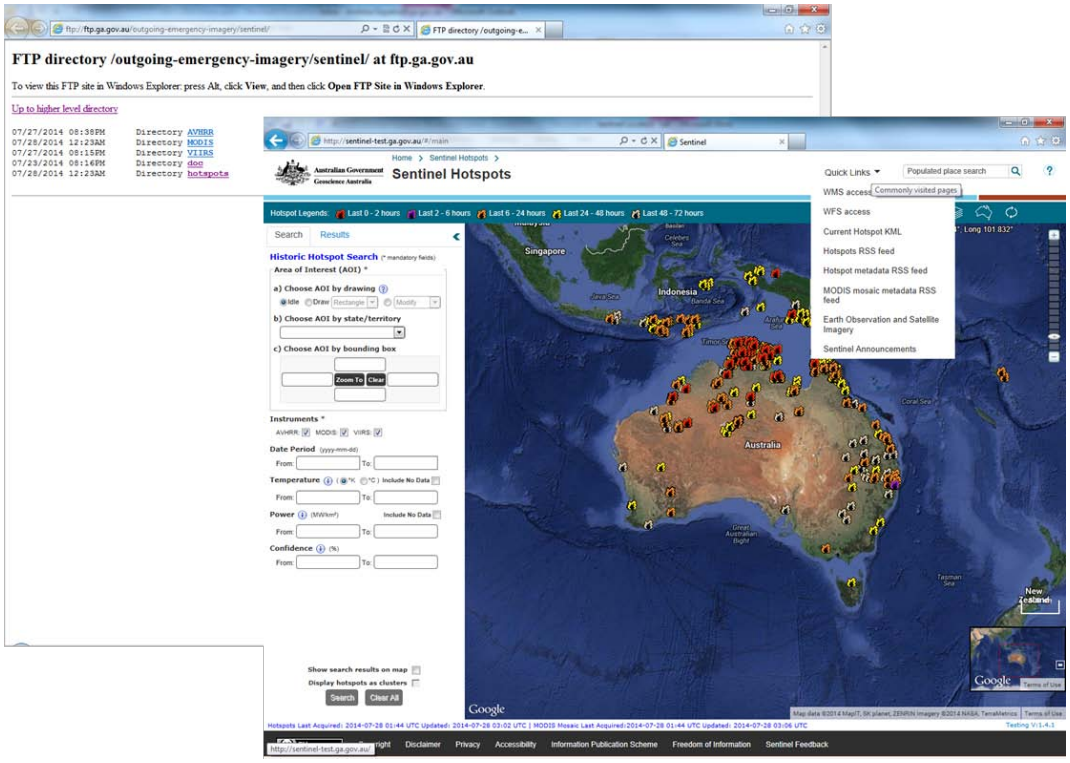
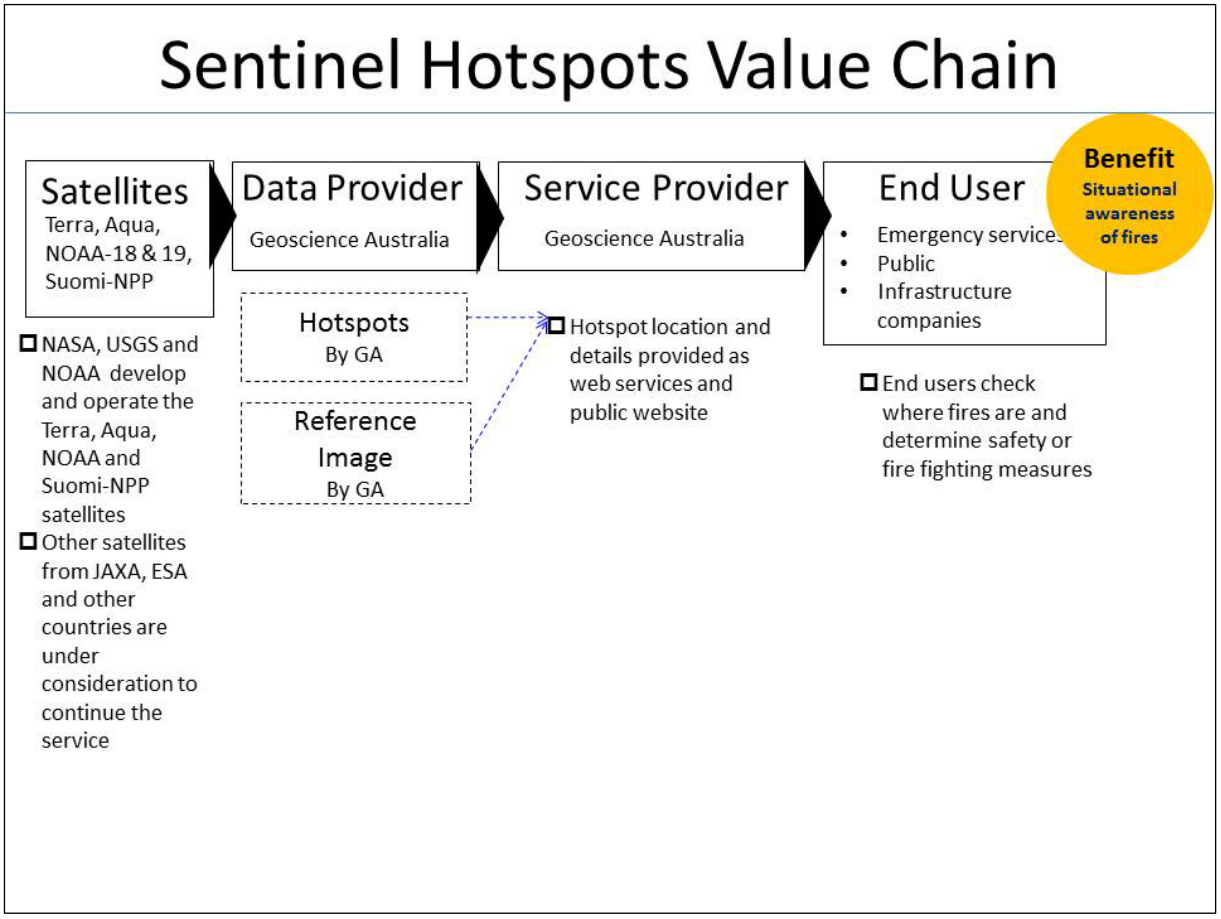


Figure 2: The Sentinel Hotspots website, showing the various available data distribution systems – WMS, WFS and FTP.

Sentinel Hotspots has provided fire information for over ten years, helping natural resource managers, emergency response personnel and the public to understand their fire danger. The Hotspots system has become a standard data source for the fire fighting services of all Australian states and is integrated into their data systems, such as that of the New South Wales Rural Fire Service. Forestry managers and powerline companies are also major users of the Hotspots service, using the historic hotspot search function to analyse how often and where fires have occurred over their assets.



References

Giglio, L., and Justice, C.O. (2003) Effect of wavelength selection on characterisation of fire size and temperature. Int J. Remote Sensing 24(17), 3515-20.

Giglio, L., Descloitres, J., Justice, C.O., Kaufman, Y.J. (1999) An Enhanced Contextual Fire Detection Algorithm for MODIS. Remote Sensing of Environment 87, 273-82.

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Great Flood Monitoring with Fengyun 3A Satellite data

It is hard to have an overall view of the flood situation in large area to facilitate the disaster reduction and relief when a great flood occurs. Satellite data, in particular km or lower level resolution data, may capture the flood information for a very large area with one or two times a day. So the evolution and the spatial situation of flood are also able to be monitored daily and then the information may help decision makers and public people to conduct the flood relief.

Problem

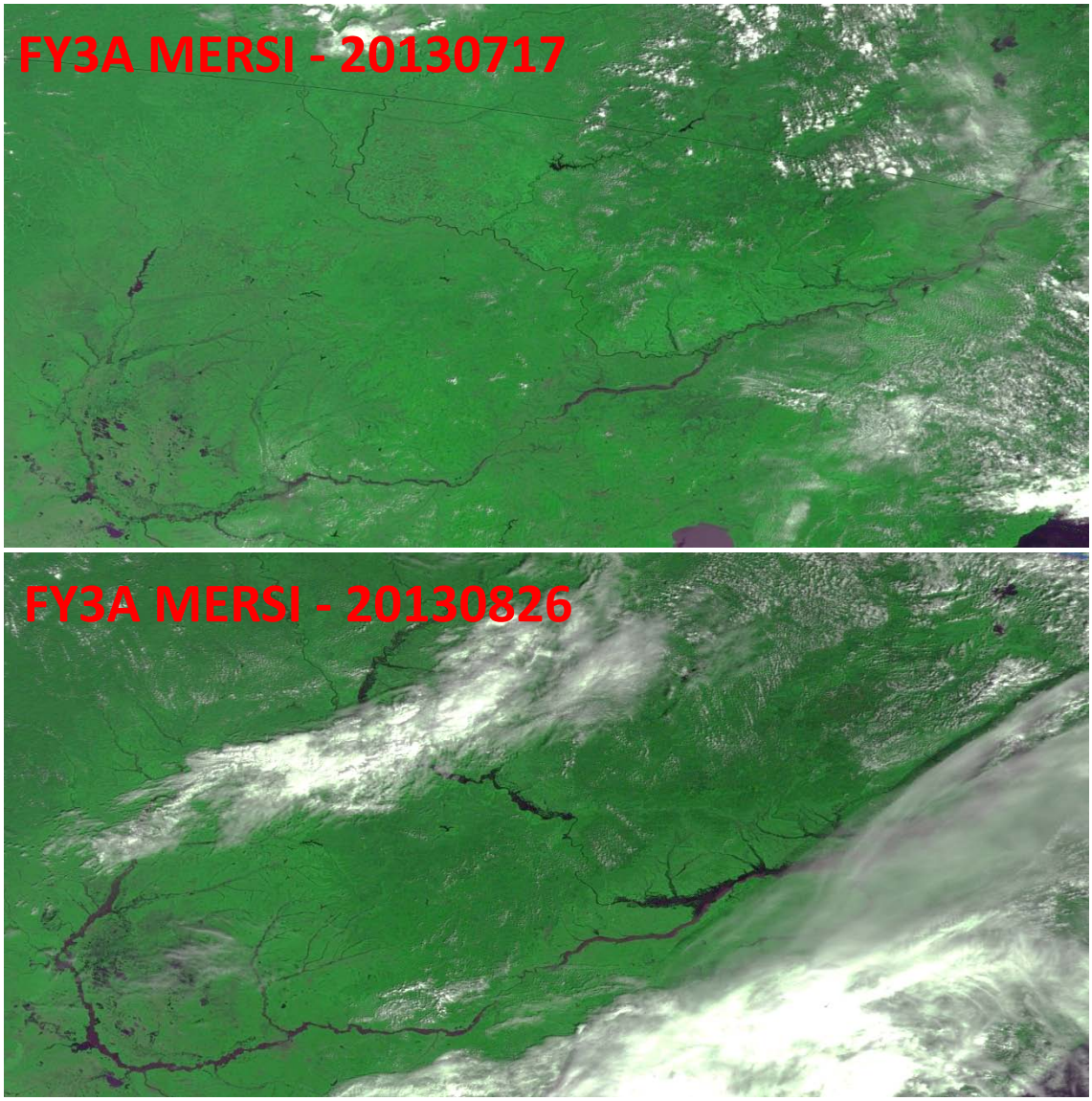
Flood, a natural phenomenon, causes the loss of people and property. Flood often affects the large areas of the both river sides. The overall situation of the flood occurring in the river basin is of importance for the decision maker to take sound measures to rescue people in the affected area and evacuate people in the downstream area in time. Public people also keep eyes on the occurring flood and look forward to have more detailed and precise information. Satellite observation is one of key means to capture the overall information in a timely manner although there are some limitations, such as cloud, swath coverage and resolution. It is able to provide the overall view information for a very large area with higher frequency in comparison with the high resolution satellite data, although the low resolution satellite data is unable to provide the precise damage information for a specific small area. So the low resolution satellite data is particularly useful to monitor and follow the evolution of flood in large area. This article is demonstrating a case of monitoring the great flood in Northeast China in 2013 with Chinese meteorological satellite data.

Satellite Earth Observation Data Application

In summer 2013, a great flood occurred and lasted for 2 months in Northeast China and neighboring Russian area. It reportedly caused direct economic losses of over a billion US dollars. The driving force was the heavy sustained rainfall in July 2013 in the upstream area of the Heilongjiang River that filled to the full of the dams. Later the discharge water and the heavy sustained rainfall again in the middle area of the river in early middle August made the situation much worse. Later on the water level increased vary rapidly, finally water broke the bank and flooded lots of residential compounds, farmlands and villages.
During this event, the Chinese central and local governments made scientific decisions and took sound measures to manage the flood and relief people. Some decision support information about the flood situation was retrieved from Chinese meteorological satellite (also named Fengyun Satellite) data. One of sensors onboard Fengyun 3A is MEdium Resolution Spectral Imager that

provides 250 m data with 5 channels. The flood information was retrieved from these 5 channels. MERSI data were acquired, preprocessed in the National Satellite meteorological Center of the China Meteorological Administration and later made open and freely available on the data portal (http://satellite.cma.gov.cn). The experts of NSMC/CMA further processed and retrieved the water body information from the MERSI data with the classification methods, and compiled with other reference and base data into a written report that was submitted to the decision makers and posted on the web.

With the daily water body information, the decision makers knew where and when the flood was severe and where the efforts should go. The image (above) shows normal water bodies before the flood. Water is in black. Rivers were narrow. The image (bottom) shows the water bodies in the peak flood. Rivers became wider. Water broke the bank in the downstream during the peak flood. Water bodies came back to the normal finally at the end of September.



Value Chain

See powerpoint file

More information

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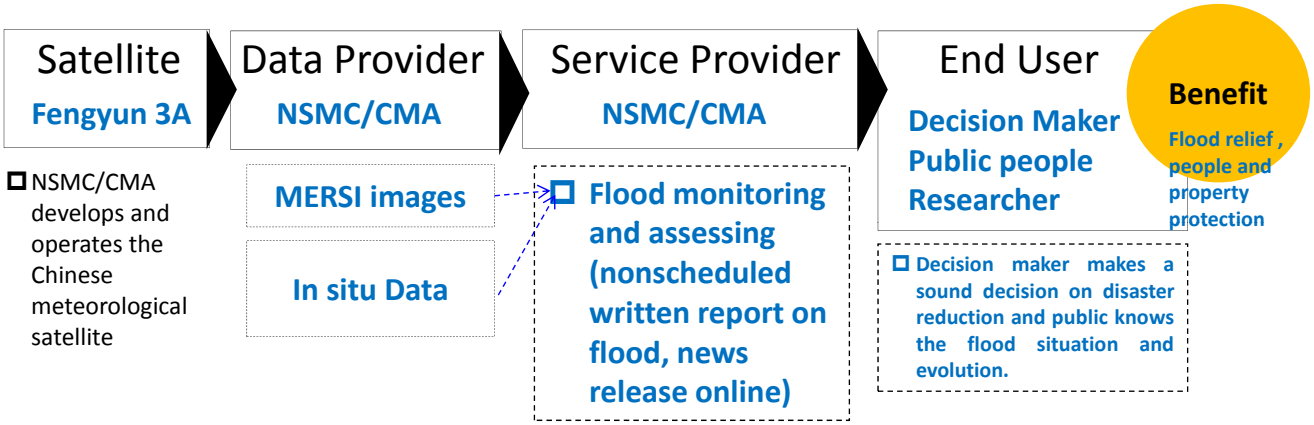
Satellite
Fengyun 3A
Data Provider
NSMC/CMA
Service Provider
NSMC/CMA
End User
Decision Maker
Public people
Researcher
Benefit
Flood relief , people and property protection
NSMC/CMA develops and operates the Chinese meteorological satellite
MERSI images
In situ Data
Flood monitoring and assessing (nonscheduled written report on flood, news release online)
Decision maker makes a sound decision on disaster reduction and public knows the flood situation and evolution.