



# The International Charter Space and Major Disasters NEWSLETTER

October, 2021 | Issue 23



Activations on map



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## Highlights

### ISRO Charter Leadership

**Indian Space Research Organisation (ISRO)**, a member of the Disasters Charter since 2001, has taken up the responsibility of leadership of the Charter in April 2021 from Japan Aerospace Exploration Agency (**JAXA**). Due to the prevailing COVID-19 situation in India, ISRO organized the 45<sup>th</sup> meeting of the Charter in virtual mode. All 17 Agencies participated in the meetings.



### ESA Charter Mapper

Charter reached a new milestone, with the introduction of an online processing environment for visualisation and processing of EO data. This Processing Environment (PE), commissioned by ESA and implemented by Terradue, is called the ESA Charter Mapper.

### Satellogic – New Data Provider

The Charter is pleased to welcome Satellogic as the latest contributor of satellite data for aiding emergency response efforts in the event of major disasters. Satellogic operates an Earth Observation platform that collects high resolution multispectral imagery, hyperspectral imagery, and full-motion video.

### Sir Arthur Clarke Award

The Disaster Charter was nominated for the Industry/Project Team award, up against tough competition. Being nominated for a Sir Arthur Clarke Award is a great achievement, which the entire Disaster Charter should be incredibly proud of.

### CNSA – New Satellites

CNSA is willing to contribute three new-generation meteorological satellites, FY-2H, FY-4A and FY-3D to Charter for providing more meteorological satellites data to the climate-relevant disasters.

### Russian Authorised User

The Russian National Disaster Management Authority, EMERCOM, is a Charter Authorised User (AU) and benefits from the Earth observation satellite data of the Charter members, since August 2013 and EMERCOM have significantly increased its ability to prevent and eliminate consequences of emergency situations.

### Volcanic Eruption – Pleiades DEM

The DEM derived from stereoscopic Pleiades data over the Volcano and the Pleiades' high spatial resolution and radiometric sensitivity revealed a thick layer of ash around the explosive crater. Pyroclastic flows could also be clearly seen filling the valleys radiating out from the volcano's summit.



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## Indian Space Research Organisation (ISRO) – Charter Leadership

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During the ISRO leadership period,

- A new mile stone is reached by introducing online facility for quick visualisation and processing of the Charter satellite data to support Project Managers & Value Adders activities.
- A new satellite data provider, Satellogic has joined the Charter,
- The Charter got the distinction of reaching the finals of 'Sir Arthur Clarke Award'.
- National Academy of Sciences (NAS), Belarus, is ready to become the Charter Member.
- The Charter has supported about 30 major disaster events across the Globe.

The leadership of the Charter rotates every six months and after ISRO leadership, Instituto Nacional de Pesquisas Espaciais (**INPE**), Brazil starts leadership in October, 2021.







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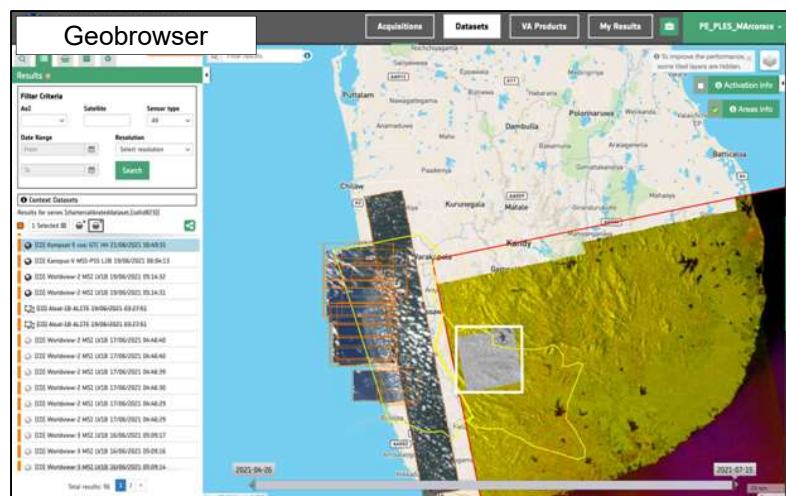


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## ESA Charter Mapper

Charter reached a new milestone, with the introduction of an online processing environment for visualisation and processing of EO data. This Processing Environment (PE), commissioned by ESA and implemented by Terradue, is called the ESA Charter Mapper. It is able to ingest and calibrate the EO data delivered by EO mission owners and operators collaborating within the International Charter. The Charter Mapper is fully embedded in the 'Charter Operations System version 2' (COS-2), the data workflow management system that supports the orchestration of the Charter operations.

The Trial of the Charter Mapper has been conducted using EO data products organized into test sites for which both automated and on-demand processing chains were available. Charter members and partners working with the Charter have taken part to a trial to test the ability of a new system to process EO data for disaster response. The Charter PE Geobrowser (below) showing the available datasets of one of the Charter activations.



The Charter Mapper implemented by ESA is available for operations since August, 2021. The potential provided by this system can be exploited on an emergency basis during Charter activations and it also can support capacity-building for instance in training events with Charter Project Managers for explaining how EO data are used for disaster response.

During a Charter Activation, the Charter Mapper implemented by ESA allows the Project Manager and Value Adding providers to access, analyze and transform EO data seamlessly and rapidly, reducing their burden with pre-processing and processing chains running in the background or triggered by them on-demand. The example of Australian Fire, as preprocessed by the ESA PE is shown below.





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## Satellogic – The New Charter Data Provider

The International Charter Space and Major Disasters is pleased to welcome Satellogic as the latest contributor of satellite data for aiding emergency response efforts in the event of major disasters.

Founded in 2010 in Argentina, Satellogic operates an Earth Observation platform that collects high resolution multispectral imagery, hyperspectral imagery, and full-motion video, as detailed in the Table below.

Instrument Type	Resolution	# Of Bands	Characteristics
Multispectral Imagery	0.7 m	4	5 km swath width, GeoTiff format
Hyperspectral Imagery	25 m	29	125 km swath width, GeoTiff format
Full-motion Video	1 m	N/A	Monochromatic, up to 60 sec duration, MP4 (HD)

The vertically integrated company manufactures its own spacecraft and provides both tasking and data processing services. Satellogic becomes the third private-sector data provider to offer support to the Charter, following Planet (USA) and ICEYE (Finland).

A unique feature of the company's approach is that it uses a low-earth-orbit constellation of satellites to provide both high-frequency and high-resolution imagery for the globe. They employ a unique patented camera design that captures 10-20 times more data from a single satellite than any other small satellite platform. A single satellite can continuously collect data over land and can acquire 300,000 sq km per day. By leveraging Satellogic's fleet of satellites and expert in-house data science team, the Charter will have access to high-frequency mapping and change detection for supporting disaster response.

The example in figure below shows data that Satellogic collected for a disaster event in India earlier this year. In February of 2021, a large rock and ice avalanche caused a massive flash flood along the Dhaul Ganga river in Uttarakhand's Chamoli district, endangering the lives of people living along its banks and partially destroying the Tapovan Hydro Plant among other structures. Ultimately, the disaster left over 200 killed or missing. In addition to the mapping of flooded and flood-damaged areas, the high resolution Charter data was also used to identify the source of the disaster by mapping the areas where the rockslide/avalanche occurred.

With a growing need for high-resolution and high-frequency optical data to support disaster management, the imaging capabilities of Satellogic will be invaluable to the International Charter. The addition of Satellogic as a private-sector data provider, is contributing to a new era for the provision of no-cost satellite observations for disaster response.







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## Sir Arthur Clarke Award Finalists

### Disaster Charter nominated for prestigious Sir Arthur Clarke Award

The Disaster Charter was nominated for a Sir Arthur Clarke Award at a recent ceremony in the UK.

Members of the Charter attended the Reinventing Space Conference Gala Dinner, where the winners were announced. The awards recognise and reward those individuals and teams that have made notable or outstanding achievements, or contributions to, space activities in the past year.

The Disaster Charter was nominated for the Industry/Project Team award, up against tough competition. The other nominations in the group were The Goonhilly-6 Deep Space Antenna - Project team: For converting a 1958 Intelsat communications antenna into the world's first privately operated ESA-approved Deep Space Antenna, now controlling Mars Express and The Solar Orbiter Industry Team - Airbus Defence & Space: For the design and construction of the Solar Orbiter, launched in 2020 and now delivering science from its orbit closest to the sun of any camera-equipped spacecraft.

On the exciting night, the Goonhilly-6 Deep Space Antenna team took home the award, but it is a great achievement for the Disaster Charter to be recognised by industry and nominated for this prestigious award.

Emily Gravestock, Head of Space Applications Strategy, UK Space Agency, said: "Being nominated for a Sir Arthur Clarke Award is a great achievement, which the entire Disaster Charter should be incredibly proud of. Sadly, this time we weren't the winner but a big congratulations to the fantastic team at Goonhilly."

Other awards celebrated achievements in Education & Outreach, Academic Study/Research and Lifetime Achievement.

Find out more about the nominations and winners here: <https://www.bis-space.com/the-2020-sir-arthur-clarke-awards-winners-announced/>







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## CNSA - New Satellites

CNSA is willing to contribute three new-generation meteorological satellites, FY-2H, FY-4A and FY-3D to Charter for providing more meteorological satellites data to the climate-relevant disasters.

### 1. FY-2H Satellites

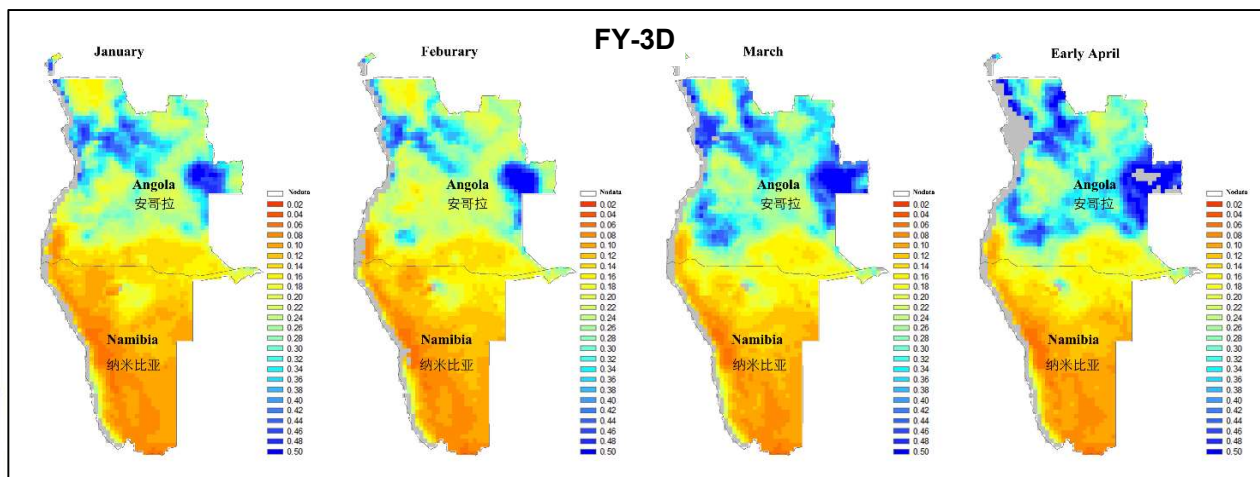
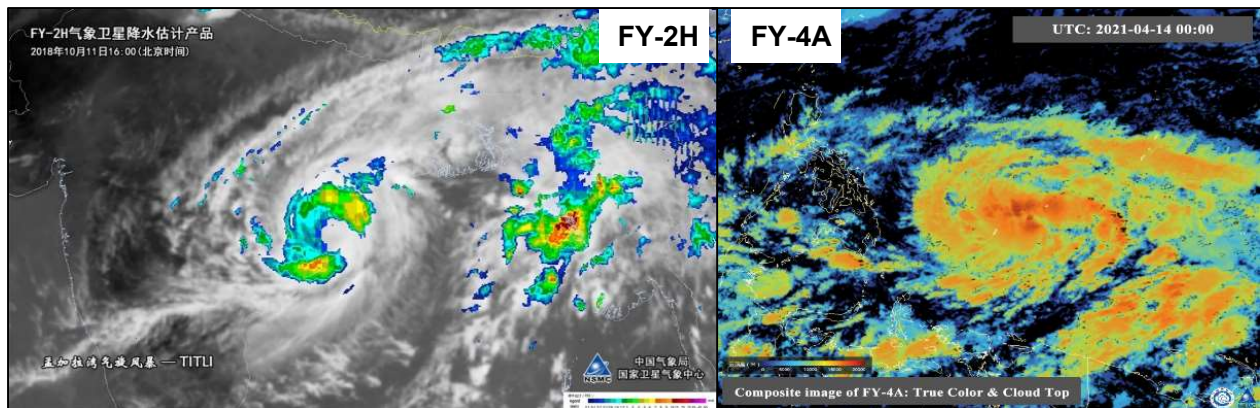
FY-2 is the first generation geostationary meteorological satellites developed by China. FY-2H was successfully launched in June 2018. In order to strengthen the satellite observation of the Belt and Road regions and support the WMO-sponsored Indian Ocean Data Coverage program, it has been repositioned westward from 86.5°E to 79°E.

### 2. FY-4A Satellites

FY-4 series is China's second generation geostationary meteorological satellites. FY-4A was launched successfully in December 2016. It is enabled with vertical atmospheric sounding and microwave detection capabilities to address 3D remote sensing at high altitudes. It is also enabled with solar observations for extreme ultraviolet and X-rays, in a bid to enhance China's space weather watch and warning capability. The satellite produces earth disc imageries every 15 minutes.

### 3. FY-3D Satellites

FY-3D, the fourth satellite in China's second generation polar-orbiting meteorological satellite family, was launched successfully in November 2017. FY-3D is a satellite with the largest number of spectral measurement channels in China, which will greatly enhance the capacity to detect the capacity to detect the low-level atmospheric dynamic parameters, thermal parameters, GHGs, hence the capability and skill in such aspects as global NWP, global climate change response, ecological environment monitoring and Space weather forecasting







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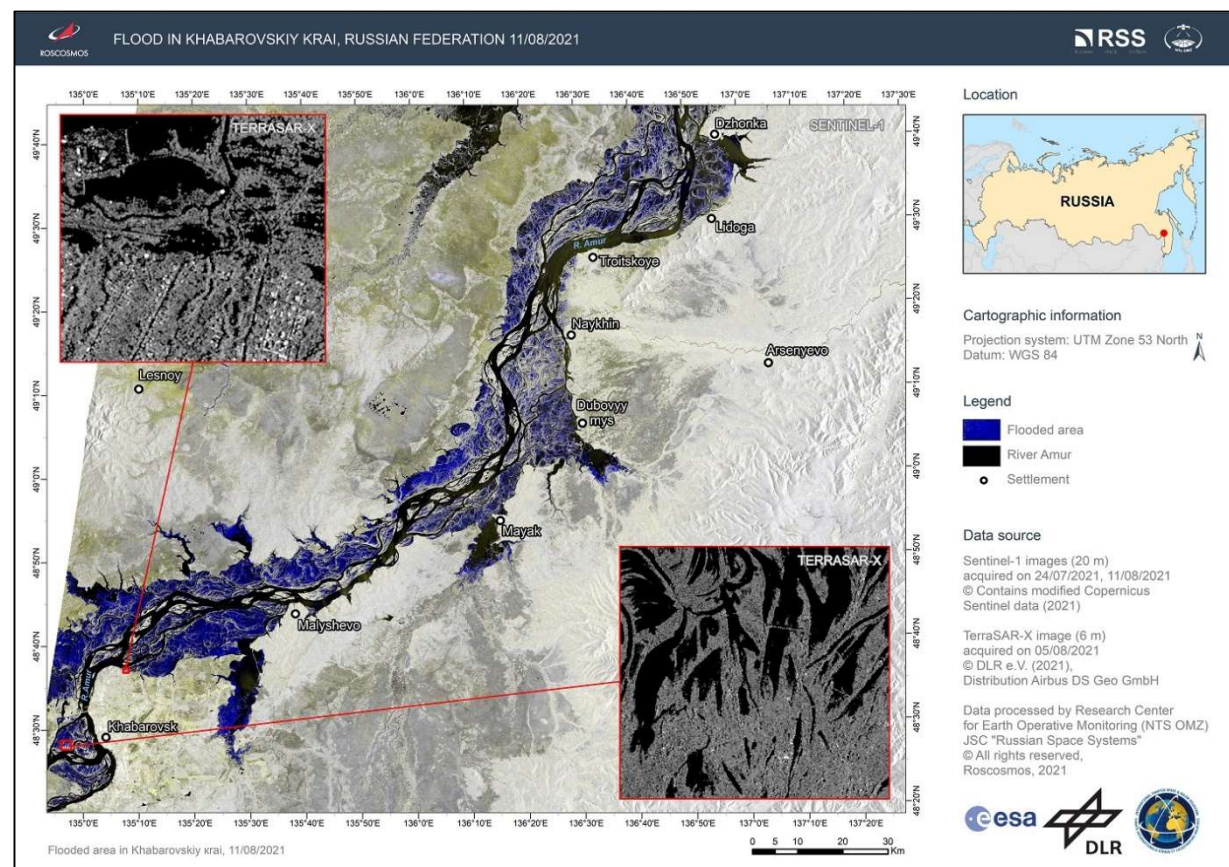
## Russian Authorised User - Interaction & Feedback

The Russian National Disaster Management Authority, EMERCOM, is a Charter Authorised User (AU) and benefits from the Earth observation satellite data of the Charter members, since August 2013. Up to September 2021 EMERCOM of Russia has activated the Charter for satellite imagery to monitor 27 major disasters occurred in Russia and abroad including 17 floods, 6 forest fires and 4 technological and other types of disasters. More than 300 mil sq. km (several thousands of scenes) of new and archive satellite data of high and medium resolution were received from the members of the Charter and used for emergency support, damage assessment maps and derived information products.

The SAR data provided by the Charter members are widely used by EMERCOM for hydro-meteorological risks assessment, disaster mitigation operations and derived products creation, including water mask determination and flood inundation modelling, landslides and mudslides damage assessment. Charter HR and VHR optical data are proven to be valuable for the purposes of environmental monitoring, search and rescue operations planning and conduct, emergency forecasting and prevention, including burned forests and hot spots location and identification, hazardous infrastructure facilities destruction and safety assessment and terrain damage scale assessment, etc.

Since ROSCOSMOS State Corporation became the Charter member, it provides PMs for all the Charter activations requested by EMERCOM.

Since joining the Charter in 2013, Russian Emergency Ministry EMERCOM have significantly increased its ability to prevent and eliminate consequences of emergency situations and support search and rescue operations at the areas affected by natural and technological disasters in mainland and abroad. The EMERCOM would like to take this opportunity to thank all the Charter member agencies, the data providers and the Roscosmos PMs for the high level of interoperability and cooperation to benefit disaster monitoring and mitigation in Russia and in the world and congratulates the International Charter of Space and Major Disasters with its forthcoming 21st anniversary of successful activity.







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## Volcanic Eruption – Pleiades DEM

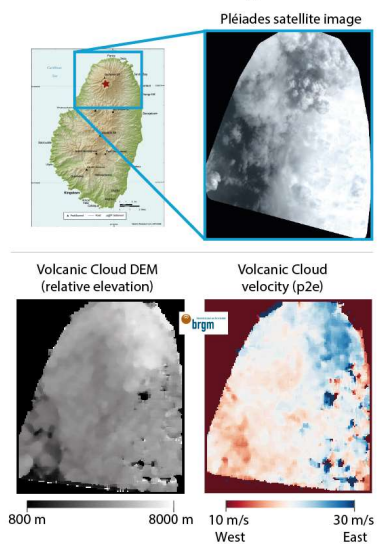
In response to the Charter activation on Volcanic Eruption in Saint-Vincent and the Grenadines, CNES was tasked to provide Pleiades images of the volcano. In this case, the CNES / Pleiades response was "upgraded", by tasking the satellite in stereoscopic mode, instead of monoscopic. This enhancement of the technical specifications of the tasking allowed for simultaneously covering the commitment of CNES as part of the Charter response, as well as satisfying the request expressed by scientists involved in the crisis management. Volcanologists of IPGP and SRC/UWI used the Pleiades images acquired in stereo mode to perform real-time estimations of the volume of tephra emitted by the volcano, which would otherwise be less reliable if only monoscopic images had been acquired.

The image acquisition strategy was to point the Pleiades-1A and Pleiades-1B satellites at the eruption zone on each pass. Stereo images were collected for 10 consecutive days, exploiting the satellites' ability to steer their optical system on any target within their field of view. Each acquisition consisted of a pair of images from different viewing angles taken a few tens of seconds apart on the same satellite pass, to increase the chances of getting a clear picture and obtaining the volcano's topography by stereo-photogrammetry.

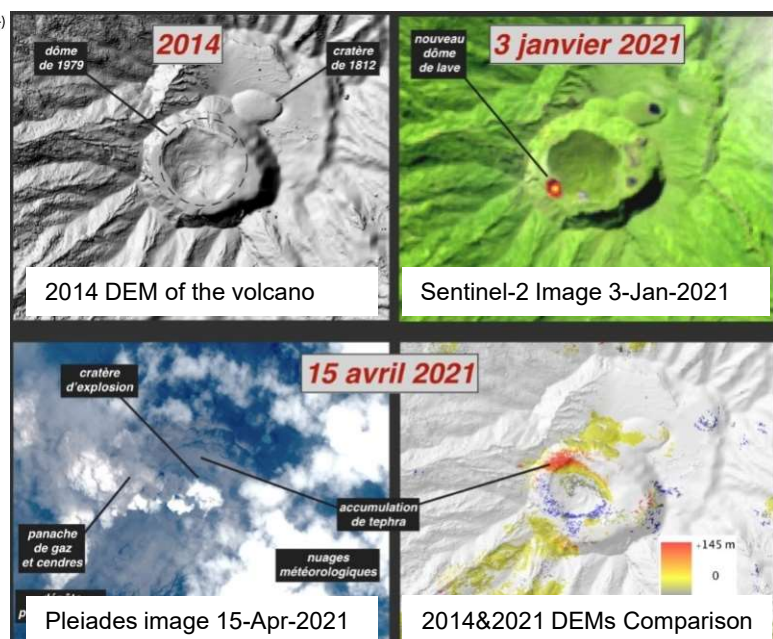
The aim of these acquisitions was to 1/ Track the lava flow precisely, combining Digital elevation models (DEM) of the volcano at a resolution of 2 metres, derived from (a) Pleiades imagery acquired in 2014 and new acquisitions during the crisis phase, (b) data processing with the MicMac software suite to generate a very precise 3D image of the topography prior to the lava flow (Grandin and Delorme, 2021), (c) data from the Copernicus Sentinel-1 and Sentinel-2 satellites to monitor the eruption hotspot and ground deformation, (d) in-situ aerial data acquired by drones, 2/ Track the elevation and velocity of the volcanic plume using a method developed by the French geological survey BRGM (Michele et al, 2016) and adapted to Pleiades satellite imagery. Pleiades' high spatial resolution and radiometric sensitivity revealed a thick layer of ash around the explosive crater. Pyroclastic flows could also be clearly seen filling the valleys radiating out from the volcano's summit.

The MicMac software suite was used to generate very-high-resolution digital elevation models in a short time frame, thanks to an on-demand processing service developed by the ForM@Terre and ISDeform research groups, with the support of CNES and Université de Strasbourg, which revealed an accumulation of ash more than 100 metres deep near the crater. The eruption has released several million cubic metres of material, indicating an eruption of a magnitude comparable to the 1902 eruption of Mount Pelée on Martinique.

Eruption of La Soufrière Saint Vincent, 12 April 2021:  
volcanic cloud elevation and velocity (perpendicular to epipolar -p2e-)  
from Pléiades images



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Computation and results ©BRGM - M. de Michele  
Relief map of St. Vincent (taken from Robertson, 2005).



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