

Symbolic Remote Sensing of the Earth from Space

By Don Hillger and Garry Toth

Satellite images of the Earth, of its clouds and land features, are common on postal items. However, the techniques used for remote sensing of the Earth are less commonly shown. This article focuses on postal items showing symbolic remote sensing of the Earth, including scanning or imaging techniques used by artificial satellites.

Satellite remote sensing of the Earth

The first artificial Earth satellites were launched by the USSR and the USA in the late 1950s during the period of the International Geophysical Year (IGY). Cameras mounted on satellites soon followed, and the first dedicated weather satellite, TIROS-1, was launched in 1960. Ever since that time the Earth has been photographed by numerous un-manned satellites as well as by manned spacecraft.

Satellites in a low orbit typically take images as instruments scan across, or perpendicular to, the orbital track, with the satellite motion providing the other dimension of the image. Satellites in higher orbit take images of much larger portions of the Earth; the standard images from those in geostationary orbit (36,000 km altitude) are of the entire full disk of the Earth.

The emphasis in this article is how remote sensing is symbolically displayed on postal items. Satellite scanning or imaging is most often represented by various types of lines drawn between the satellite and the Earth. The lines symbolize the remote sensing. More than 40 postal items (mostly stamps, but also some postal derivatives such as FDCs and other covers) with symbolic remote sensing have been found. Most show scanning by un-manned satellites; several show Earth imaging from manned missions.

In this article, only the postal items with the best renditions of remote sensing are shown. All other items, including those with small or more difficult-to-see examples, can be found in the authors' website as noted at the end of this article.

The following sections include examples of symbolic remote sensing as found on different types of postal items, starting with stamps and souvenir sheets, continuing with other postal items, and concluding with satellite launch covers showing symbolic scanning or imaging in their cachets.

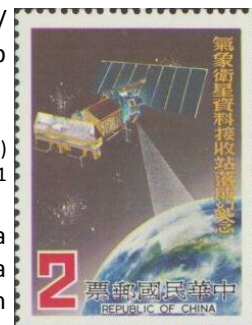
Symbolic remote sensing on stamps and souvenir sheets

Scanning of the Earth by Landsat is shown on a stamp top right from British Antarctic Territory issued in 1981. The stamp shows not only the view lines from the instruments on

the bottom of the spacecraft down to the Earth, but also the edges of the swath on the Earth traced out as the satellite moves in orbit. Similarly, the scanning of the Earth from instruments on a TIROS-N/NOAA satellite is seen on this stamp from Taiwan issued in 1981.

British Antarctic Territory (Scott 84, Michel 86) 1981; Taiwan (Scott 2221, Michel 1373) 1981

Scanning of Cuba by instruments on a Soyuz manned satellite is shown on a stamp from Cuba issued in 1980. On a stamp from Czechoslovakia also from 1980, the dashed lines outlining the image are subtle, but the scanned area is emphasized by the colour change inside the lines. The instrument in the lower-left of the stamp is the multi-spectral camera MKF-6 (Mehr-Kanal Fotografie) that was carried aboard various spacecraft from the Soviet bloc as part of the Interkosmos Programme (in this case by a Soyuz-Salyut combination). The MKF-6 took images in 6 spectral bands in the visible and near-infrared.



Cuba (Scott 2326, Michel 2475) 1980; Czechoslovakia (Scott 2306, Michel 2561) 1980

More scanning is found on a Czechoslovakian stamp (Scott 2506, Michel 2761) with attached label issued in 1984. This time the spacecraft is a Salyut space station, again part of the multi-nation Interkosmos Programme as proudly depicted on the label.

Czechoslovakia (Scott 2506, Michel 2761, and label) 1984

On a French Southern and Antarctic Territories stamp issued in 1986, the scanning is shown emanating from numerous smaller renditions of the SPOT (early-type SPOT-1, 2, or 3) spacecraft shown on the stamp rather than from the large SPOT satellite in the foreground. In one or more cases the scanning appears to be viewing the same location on the Earth as the satellite moves in orbit across that location, by



scanning both forward and backward from the changing satellite position. Images were undoubtedly made of the same terrain at various viewing angles, but *not* necessarily from the same orbit, by early SPOT instrumentation.

French Southern and Antarctic Territories (Scott C96, Michel 219) 1986

A depiction of scanning from a Soyuz-Salyut-Soyuz orbital complex is found on an East German stamp issued in 1986, and on another from 1988. Not shown is a third stamp from 1988 similar the second one, but with a different face value. On the first stamp the MKF-6 camera is again shown; on the second one a multi-channel spectrometer MKS-M (Mehrkanal Spektrometer) is featured. On that second stamp, a graphic shows the signal trace as a function of the underlying surface being scanned. Changes in the signal can be related to the surface features: a varying signal over a forest, a more constant signal over bare land, and a lower constant signal over open water.



East Germany (Scott 2531, Michel 3008) 1986; and (Scott 2676, Michel 3171) 1988.

The British crown dependency of Jersey issued two stamps in 1991 that show scanning from satellites. The first stamp shows Landsat-5 scanning the main island of Jersey with changed colours on the ground to designate the path scanned across the island. As the satellite moves in its orbit, each new scan provides an image of a slightly different rectangular area; those rectangular areas together form the image swath beneath the satellite. The second stamp shows a Meteosat weather satellite scanning the Earth. Meteosat, unlike all the satellites covered so far, is in the much higher geostationary orbit and therefore easily “sees” the full disk of the Earth. Part of a full-disk image is shown in the stamp. Such images are constructed from thousands of scans (one or more per rotation of the satellite on its axis). The full image is then assembled from all the scans.



Great Britain-Jersey (Scott 561 -562, Michel 540-541) 1991

More symbolic scanning from Meteosat is found on a stamp issued by Liechtenstein in 1991. This time, however, only a portion of the Earth over Europe and



Liechtenstein (Scott 956, Michel 1012) 1991; Mongolia (Scott 1170, Michel 1371) 1981

the Mediterranean area is shown. A Mongolian stamp issued in 1981 again shows a Soyuz capsule scanning the Earth with a rainbow colour pattern on the Earth below, symbolizing multi-spectral imaging, such as from the MKF-6 camera previously mentioned. The Interkosmos Programme logo is also on the stamp.

A stamp from New Caledonia issued in 1972 shows the TOPEX-Poseidon satellite in a drawing that greatly exaggerates the height of the satellite above the Earth. Images are shown streaming out of the satellite and into a computer, representing the electronic nature of remote sensing. The microscope at the left that appears to be examining the Earth is not totally unlike the way satellites view the Earth and symbolizes the telescopic, high resolution view provided by remote sensing satellites.

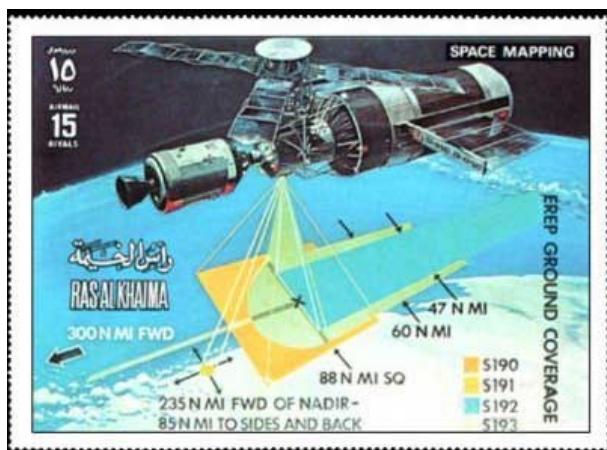


New Caledonia (Scott C268, Michel 1022) 1972

Another representation of imaging is found on a stamp issued by Hungary in 1973. The scanning appears in the shape of a pyramid that indicates the relationship of the imaging area to the point source of the sensor or camera in the satellite. In 1973 and 1974 Skylab carried an Earth Resources Experiment Package (EREP) to do a comprehensive and systematic image survey of the Earth from space. Imaging was done by several cameras, the main one with six spectral bands. Some 36,000 photos were captured by EREP. Hungary (Scott C346, Michel BL101) 1973



The next item is the most elaborate and detailed representation of remote sensing found on a postage stamp. This stamp, issued in 1972 by Ras Al Khaima (*Michel* 852), again shows EREP imaging from Skylab. The depiction of symbolic remote sensing is very similar to that of the Hungarian stamp discussed above. In addition, there are printed details giving the dimensions of the EREP images in nautical miles. Furthermore, the S-numbers at the lower right are component instruments of the EREP system: the multi-spectral cameras, infrared spectrometer, multi-spectral scanner, and microwave instrument, respectively.



Another rendition of Skylab's imaging is found on a Romanian stamp issued in 1974. This stamp again shows the pyramid-shaped symbolic imaging from Skylab's EREP camera system, but without the details provided by the previous item. Romania (*Scott* 2528, *Michel* 3241) 1974



A stamp from Russia (*Scott* 3854, *Michel* 3885) issued in 1971 shows a spacecraft that has not been identified. Of interest is the scanning of the Earth; however, the distance between the satellite and Earth is exaggerated, unless the satellite is meant to be in geostationary orbit. The same can be said for the next stamp from Russia (*Scott* 5298, *Michel* 5440) issued in 1984. The Meteor weather satellite is shown at a much higher altitude than is characteristic for that series of satellites (they were polar orbiters in a low Earth orbit). An overlay of one of the Meteor images from the southern hemisphere is shown as well.

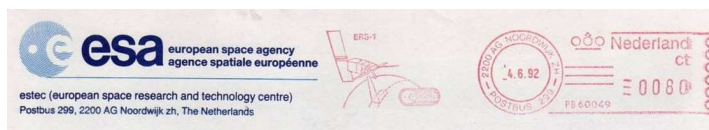


Finally for this section, a stamp issued by Togo (*Scott* 786a, *Michel* 1184) in 1991 shows an early-version TIROS with cameras on its bottom. TIROS used a "vidicon" (a storage-type camera tube) system to take images of the Earth. Those

images were transmitted line-by-line to receiving stations where they were reconstructed as pictures on facsimile paper that looked like they came directly from a camera on board the satellite. Vidicon cameras were common into the early 1980s, but were later replaced by better technology.

Symbolic remote sensing on other postal items

Symbolic remote sensing is also found on postal items other than stamps. A Netherlands postal meter from 1992 shows the ERS-1 satellite scanning the Earth. Again, the satellite appears to be too high (it is another low Earth orbit satellite), but that perspective is sometimes used to better display what the satellite is doing in orbit, from the viewpoint of one close to the satellite looking at the Earth in the distance.

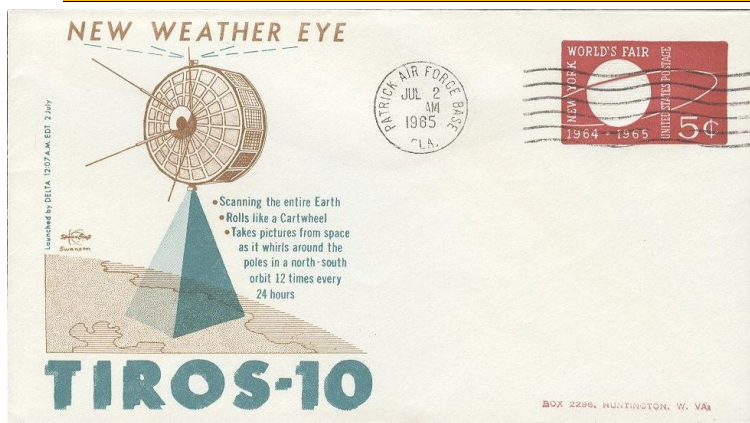


Skylab's EREP system is once again shown on a cover from the United States canceled in 1973. The depiction is very much like those on stamps already presented that also showed imaging from Skylab.



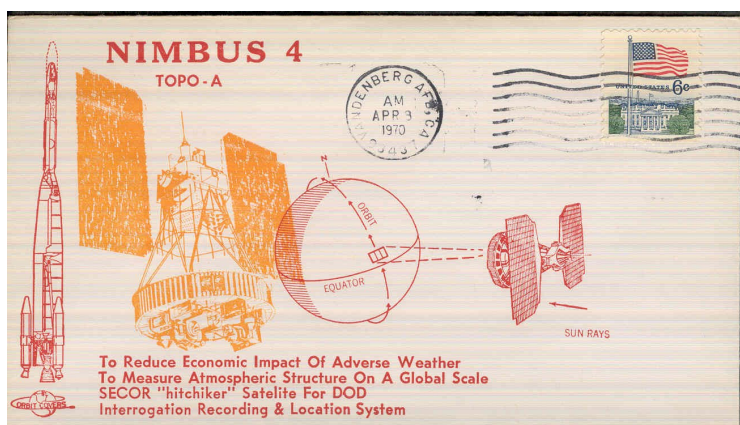
Symbolic remote sensing on satellite launch covers

Next to be discussed are images of scanning as found on launch covers for various spacecraft. These covers are cancelled on the launch dates for the satellites shown. The first one is a SpaceCraft/Swanson cachet on a TIROS-10 launch cover from 1965. The scanning "pyramid" represents the vidicon imaging used by TIROS, but this



time the camera was on the side of later-version TIROS (and similar ESSA) spacecraft from the years around 1965.

The next launch cover (below) has an Orbit cachet for a Nimbus-4 launch from 1970. Again the perspective shows the satellite at a much higher altitude than was true for Nimbus, but the scanning is nicely depicted from the instruments on the bottom of the spacecraft, as well as the rectangular imaging pixels on the Earth and the orbital track of this polar-orbiting satellite.



Next is a Space Voyage cachet on an ITOS-E launch cover from 1973. This launch failed, but other ITOS launches were successful and managed to capture images and data from more than one instrument on board. Scanning from three instruments is shown in the cachet of this particular launch cover

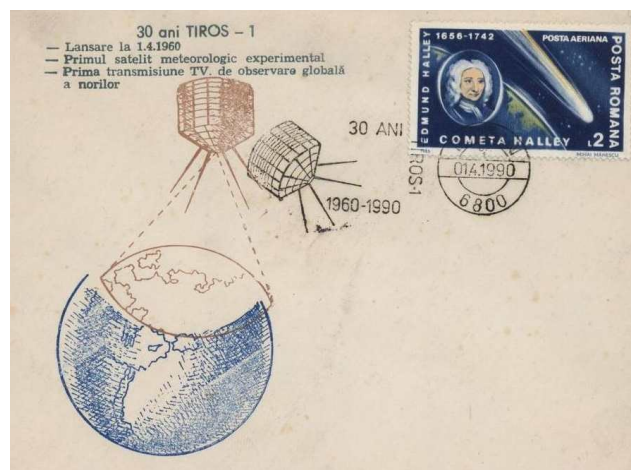


The following Space Voyage cachet on a Landsat-2 launch cover from 1975 shows the instruments looking at the US.

The arrangement of scanning lines does not represent the remote imaging very well, but at least gives the idea that the satellite is scanning the surface for data.



Finally, a cachet on a 30th anniversary TIROS-1 launch cover from Romania, from 1990, shows the spacecraft imaging the Earth below it. Details of the spacecraft and the Earth are not well represented on this cachet, but the idea of remote sensing, though symbolic, is clear.



Additional online information

A number of examples of postal items showing remote sensing of the Earth have been presented. In each case various arrangements of lines were used to represent the scanning or imaging. Some of the depictions are quite detailed, and others are much more basic, but all clearly refer to satellite-based scanning or imaging. Interested readers can consult the authors' online information at the URL given below for more examples.

A checklist of postal items showing the symbolic remote sensing of the Earth is available at <http://rammb.cira.colostate.edu/dev/hillger/satellite-images.htm>, with the symbolic remote sensing items in a separate section from the rest of the satellite images. The authors would like to hear from anyone who knows of additional postal items that may have been missed. The online information will be updated whenever new details are provided. E-mail correspondence with the authors is welcomed.