

Satellite spectrometers

COMPARISON AND SUMMARY

Moderate Resolution Imaging Spectroradiometer (MODIS)

MODIS has been collecting data on two satellites launched by NASA in 1999 and 2002. The Terra and Aqua satellites upon which MODIS is aboard, orbit the earth from north to south in the morning (Terra) and south to north in the afternoon (Aqua). Imaging the entire earth every 1-2 Days. MODIS offers extensive atmospheric land and ocean data products [1].

Specifications

Bandwidth 36 Spectral bands between 0.4 - 14.4 μm [2].

Spatial Resolution 250 m, 500 m, 1000 m [2].

Swath 2330 km transverse, 10 km longitudinal [2].

Sentinel-2

Sentinel-2A and Sentinel-2B satellites (launched 2015 and 2017 respectively) provide high spatial resolution imaging, taking over data acquired by SPOT and LANDSAT in the past. Sentinel-2 images land surfaces from 56° S to 84° N, coastal waters, and the Mediterranean Sea. Sentinel-2 maintains a sun-synchronous orbit, ensuring consistency of the angle of the sunlight incident upon the earth [3].

Specifications

Bandwidth 13 Spectral bands between 0.4422 - 2.202 μm [4].

Spatial Resolution 10 m, 20 m, 60 m [4].

Swath 290 km transverse [4].

Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)

PACE (launching 6th Feb 2024), will capture spectral data from a hyperspectral radiometer (OCI), and will also carry two multi-angle polarimeters (SPEXone and HARP2). PACE will achieve global coverage over two days [5] and will provide an extensive range of data products. PACE will also have the ability to take measurements at a finer wavelength resolution than any other sensor onboard current NASA satellites. [6].

Specifications

Bandwidth 162 Spectral bands from 0.367 to 2.247 μm [7].

Spatial Resolution TBD

Swath 2700 km [8].

Visible Infrared Imaging Radiometer Suite (VIIRS)

VIIRS launched in 2011 on the Suomi National Polar-orbiting Partnership satellite and two other weather satellites achieves global coverage every 14 hours and will provide a continuation and extension of the data collected by MODIS [9]. VIIRS has a spatial resolution of 375 m and 750 m, which is re-sampled to 500 m, 1 km, and 5.6 km in order to achieve consistency with historical data captured with MODIS [9]. The larger swath (3060 km) of VIIRS also ensure there are no gaps in coverage as compared to MODIS.

Specifications

Bandwidth 22 Spectral bands from 0.412 to 12.01 μm [10].

Spatial Resolution 500 m, 1000 m, and 5600 m [10].

Swath 3060 km [10].

Advanced Microwave Scanning Radiometer 2 (AMSR2)

AMSR2 launched aboard the JAXA GCOM-W in 2012 provides additional data collection in the microwave, allowing for day and night time data collection of the sea surface temperature and other data products. AMSR2 acheives a 99% coverage of the earth every 2 days. [11]

Bandwidth 6 Spectral bands from 3 mm to 50 mm (7 GHz to 89 GHz) [12].

Spatial Resolution 5 km, 10 km [12].

Swath 1450 km [12].

Summary

	Launched	Bands	Bandwidth (μm)	Spatial Resolution (m)	Period
MODIS	1999, 2002	36	0.4 - 14.4	250, 500, 1000	1-2 Days
VIIRS	2011	22	0.412 - 12.01	500, 1000, 5600	14 Hours
Sentinel-2	2015, 2017	13	0.4422 - 2.202	10, 20, 60	10 Days
PACE	exp. 2024	162	0.367 - 2.247	TBD	2 Days
AMSR2	2012	6	3 - 50 [mm]	5000, 10000	2 Days

References

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