# FCI 0.51 µm channel Quick Guide

**Also called: VIS0.5,** green band.

**Applicability**: Daytime only.

**Used for** (together with other channels): Daily observation of Earth features. Monitoring aerosols (smoke, dust, volcanic ash, smog); monitoring changes in surface features (water (algae blooms, sediment, etc.) and vegetation); monitoring clouds.

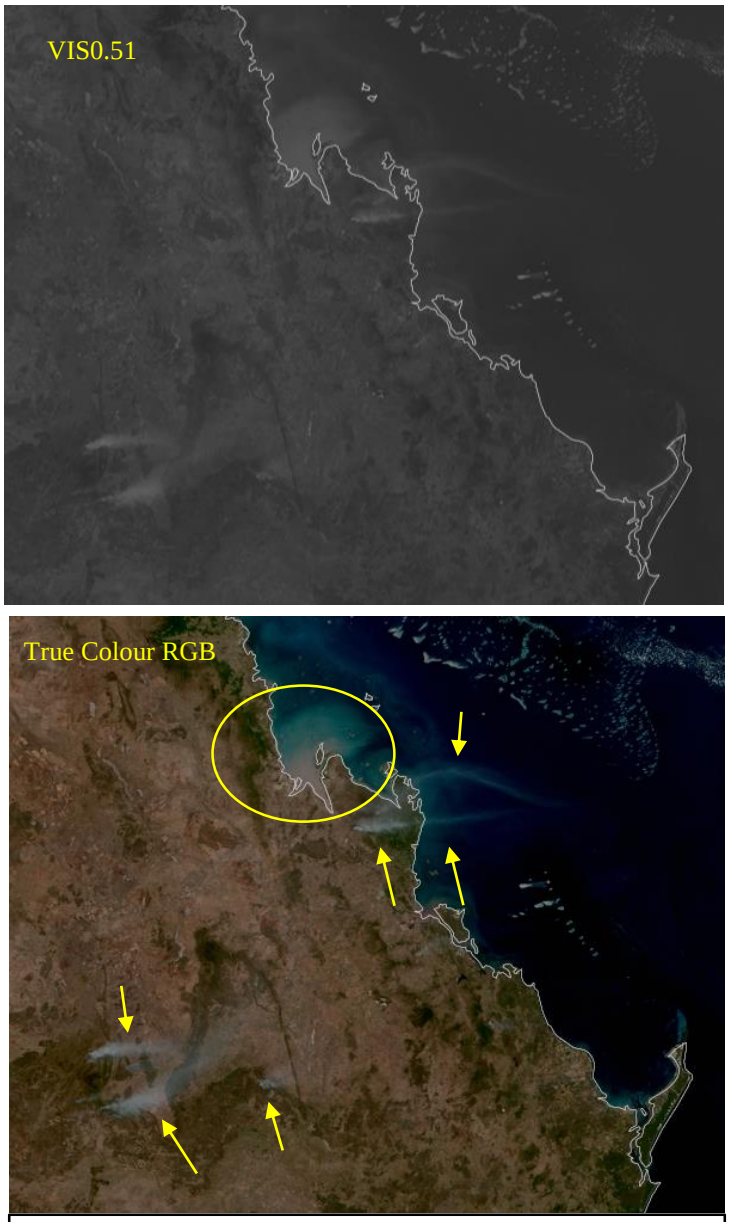
**Used in**: True Colour RGB and derived products.

**Channel Characteristics**: The 0.51 µm band measures reflected and scattered solar radiation. This wavelength is near that of the peak intensity of the Sun, and that of peak human eye sensitivity. Strong scattering by molecules, aerosols and cloud particles occurs, due to the short wavelength.

**Benefits**: Aerosol plumes are usually detectable even over land, due to the strong scattering by aerosol particles and the relatively dark background. In some conditions, the band helps to distinguish between aerosol plumes with fine and coarse particles. It helps to identify some components of sea surface water, e.g., sediment. The 1 km spatial resolution enables improved detection of smaller features.

**Limitations**: Daytime information only. Rayleigh correction recommended.

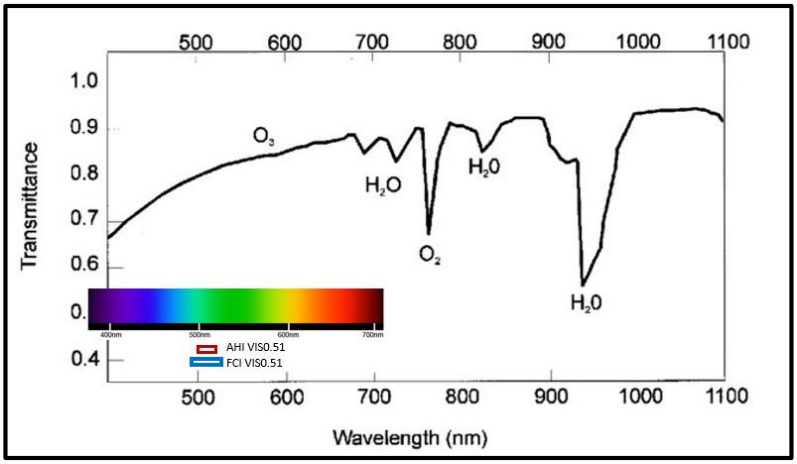
**Scattering by gas molecules in the atmosphere** (so-called Rayleigh scattering) is strong in the green spectral region, although weaker than in the blue region. In order to visualize or retrieve aerosol or sea/land surface properties, one must correct for this.
The effect **of aerosol scattering** is considerable. The image (right) shows smoke plumes, indicated by arrows. Within the encircled area, a large amount of sediment is present in the water. This is brighter in VIS0.51 than the clear water.




**Himawari-8 AHI VIS0.51 (top) and True Colour RGB (bottom) images for 16 October 2021, 04:00 UTC. Smoke plumes over north-eastern Australia (indicated by arrows) and sea water with large amounts of sediment (encircled).**

| FCI Band | Central Wavelength | Spectral Width | Spatial Sampling Distance | Spectral Characteristic | Units |
|---|---|---|---|---|---|
| 2 | **0.510 µm** | 0.040 µm | 1 km | Visible green spectrum | [%] |

Guide to colours in the True Colour RGB:
- Smoke plumes appear greyish (sometimes with slightly bluish shades).
- Sea water with sediment appears greenish cyan (lower concentration), or yellowish, brownish, reddish (higher concentration).




The graph on the left shows **atmospheric transmittance** in the visible and near-infrared region. At shorter wavelengths, the **effect of molecular scattering** is stronger. The shorter the wavelength the stronger this effect. The blue and red bars indicate the **spectral region of FCI VIS0.51 and AHI VIS0.51 (band 2) channels**, respectively. In this guide the AHI VIS0.51 is used as a proxy band for the future FCI VIS0.5 channel. Data from Sentinel OLCI sensor band 4 can be also used as proxy data.

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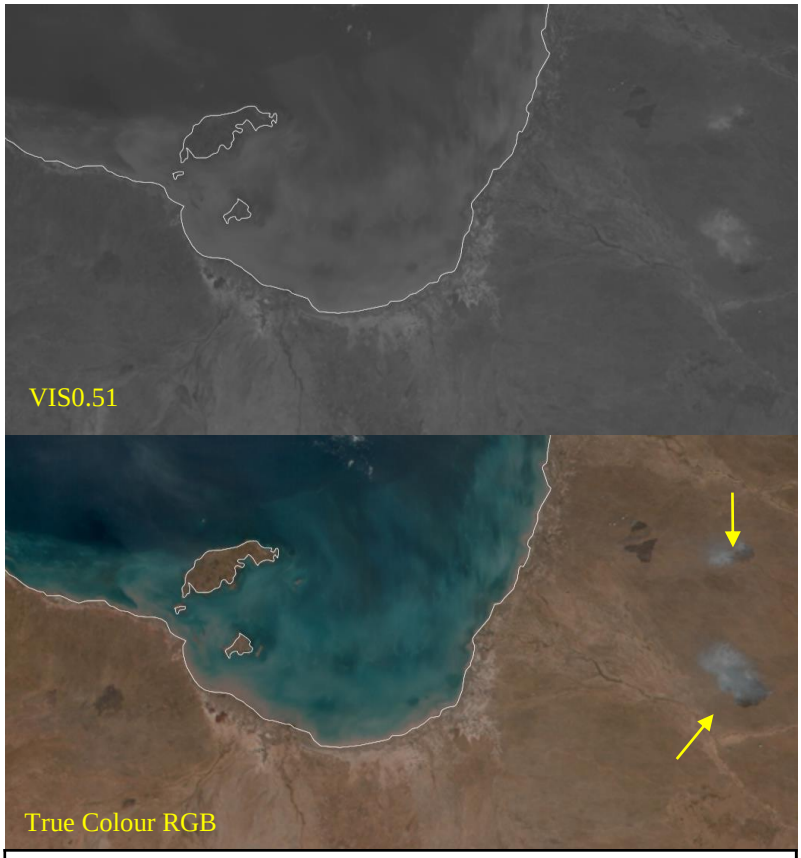
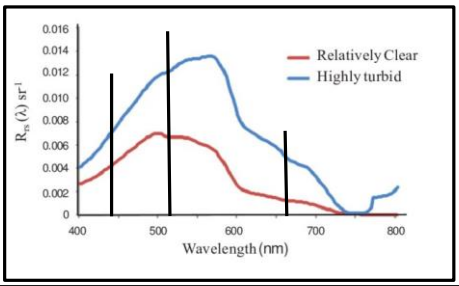



**Gulf of Carpentaria, Australia. Smoke plumes and sea water with sediment. Himawari AHI VIS0.51 and True Colour RGB for 17 October 2021, 02:00 UTC.**

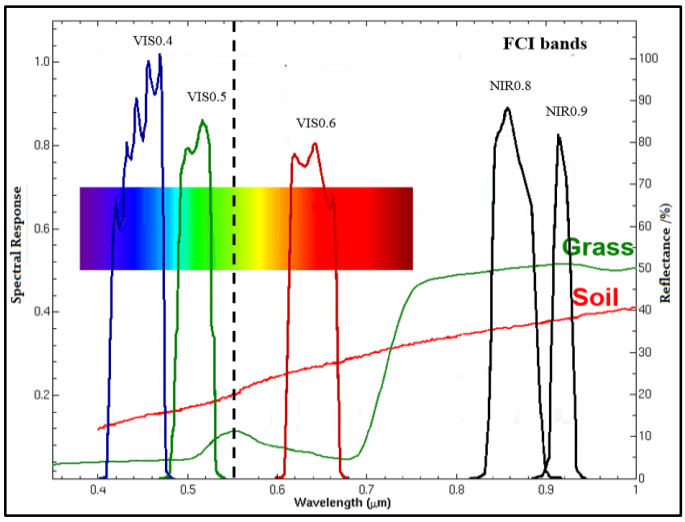
## Applications and Examples

Matter suspended in the air (aerosols) has a strong effect on the VIS0.51 reflectance. In the image on the left, smoke plumes over land are seen (indicated by arrows). Suspended matter in the sea/lake water also has a considerable effect, as seen in the images on the left and the graph below. Sediment increases the reflectance of water at all visible wavelengths, usually causing greenish cyan colours in the True Colour RGB, while clear water appears dark blue. (In the case of extremely high sediment concentration, the colour may become yellowish, brownish or reddish.)



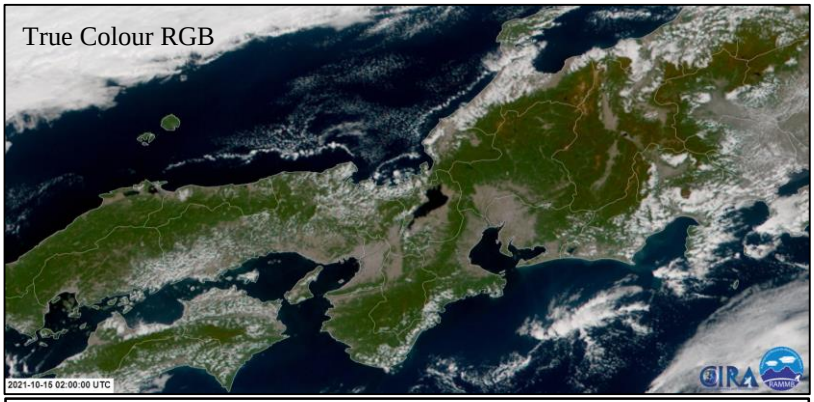

**Measured reflectance spectra of relatively clear and highly turbid sea water. The vertical lines indicate the central wavelengths of the future FCI visible channels.**
(source://www.intechopen.com/chapters/45249)

The 0.51 µm channel is used in the **True Colour RGB** in the green colour beam (after correcting for the effect of Rayleigh scattering). As the 0.51 µm channel does not contain the local maximum of chlorophyll reflectance, it is recommended to combine it with the NIR0.86 channel (both for AHI and FCI) in order to obtain natural colours for green vegetation.




**Spectral response functions of FCI bands 1–5. Reflectance of grass and soil. Visible spectral range with the corresponding colours. The vertical broken line indicates the location of the maximum reflection of radiation by chlorophyll in the visible region.**

## Use in RGB Imagery




**AHI True Colour RGBs over Japan, 15 October 2021, 02:00 UTC.**

The True Colour RGB distinguishes vegetated land from bare soil and land from water surfaces. It provides information on sea surface water composition by distinguishing clear water from, e.g., algae-laden water or water with sediment.
It detects aerosol plumes, such as dust, smoke, volcanic ash or smog; these usually appear grey. As smoke consist of fine particles, it may appear slightly bluish (strongest reflectance in the blue channel), while dust clouds consisting of coarser particles often appear slightly brownish, (strongest reflectance in the red channel).

See also: Himawari AHI Fact Sheet Band 2
EUMeTrain True Colour RGB Quick Guide