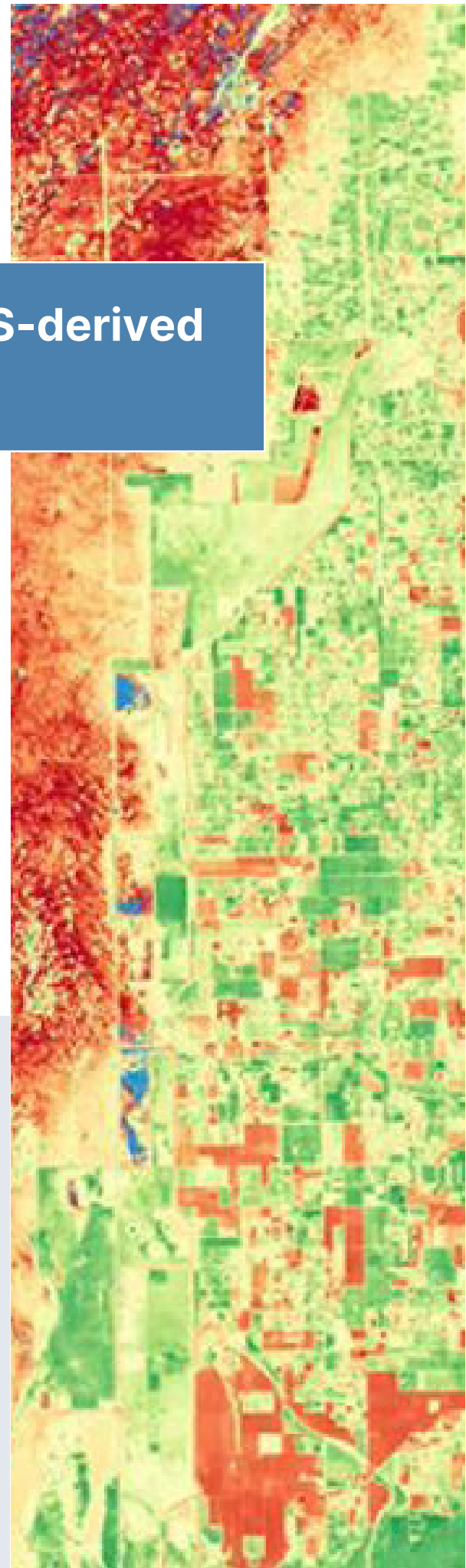


National Aeronautics and
Space Administration



Training Resources: Global HLS-derived Vegetation Indices Suite

Summary

The Harmonized Landsat and Sentinel-2 (HLS) Vegetation Indices (VI) suite is a Satellite Needs Working Group (SNWG) solution that generates nine vegetation indices from HLS data.

A number of training resources relevant to this solution are aggregated into five categories (specified below). For more information about this solution, visit the [HLS Solutions webpage](#).

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Fundamentals of Remote Sensing

This category's resources provide an introduction to remote sensing techniques used to develop this solution.

<p><u>The Role of Remote Sensing in Vegetation Studies</u></p>	<p>ArcGIS StoryMap presentation on how remote sensing can be used for studying vegetation, with basic information on vegetation indices and examples of how they are used in real-world applications.</p>
<p><u>Remote Sensing Phenology</u></p>	<p>Web resource on remotely sensed phenology, the study of plant life in relation to the seasons and a primary target of study through vegetation indices like the ones used in the HLS-VI suite.</p>
<p><u>Understanding Phenology with Remote Sensing</u></p>	<p>Training from the NASA Applied Remote Sensing Training (ARSET) Program on the use of NASA remote sensing data for mapping vegetation health and seasonal patterns.</p>

Missions and Instruments

This category's resources describe the missions and instruments used to develop this solution.

<p><u>Landsat</u></p>	<p>Landsat homepage that describes the mission and links to various resources. Note that Landsat 8 and 9 missions are used in the development of HLS.</p>
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<u>Sentinel-2 Missions</u>	<p>Sentinel-2 applications homepage providing an overview of the Sentinel-2 mission that is used in the development of HLS, with links to global case studies.</p>
<u>Landsat with Sentinel: Global Coverage</u>	<p>Webpage describing the benefits of a combined Landsat Sentinel product with helpful visualizations showing how the use of two different satellite missions results in a reduction of the time it takes to obtain global observations.</p>
<u>HLS Overview</u>	<p>HLS project page providing an overview of HLS that links to additional resources including data access, HLS vegetation indices and low-latency products, and the HLS Earthdata Forum where users can ask questions and view feedback.</p>
<u>Harmonized Landsat and Sentinel-2 Homepage - Goddard Space Flight Center (GSFC)</u>	<p>HLS homepage with information on HLS algorithms, product descriptions, data access (including information on the VI suite), and documentation.</p>

Data Products and Descriptions

This category's resources describe the solution's resulting data products and provide other descriptive materials.

<u>HLS-VI: SNWG Solution Fact Sheet</u>	<p>SNWG solution fact sheet for the HLS-VI suite that includes an overview of the solution, its scientific and societal benefit, and data specifications such as temporal coverage and spatial resolution.</p>
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<p><u>HLSS30_VI Dataset Landing Page</u></p>	<p>Dataset landing page for the HLS Sentinel-2 Multi-spectral Instrument Vegetation Indices Daily Global 30 m (HLSS30_VI) product that provides data access, a product description, dataset characteristics, documentation links, a list of variables available within the dataset, and other product information.</p>
<p><u>HL30_VI Dataset Landing Page</u></p>	<p>Dataset landing page for the HLS Operational Land Imager Vegetation Indices Daily Global 30 m (HL30_VI) product that provides data access, a product description, dataset characteristics, documentation links, publications that cite the dataset, a list of variables available within the dataset, and other product information.</p>
<p><u>HLS-VI Product User Guide</u></p>	<p>User guide for the HLS-VI product suite that provides information on spatial coverage, along with details on HLS-VI products and product formats.</p>
<p><u>Global uncertainty assessment of vegetation indices from NASA's Harmonized Landsat and Sentinel-2 Project</u></p>	<p>Publication detailing the uncertainties associated with 21 HLS-based vegetation indices (the nine HLS-VI products plus 12 additional indices).</p>

Data Access and Code Examples

This category's resources provide links to access the solution's data as well as open source code for using the data.

<u>Earthdata HLS-VI Data Access</u>	<p>Access HLS-VI data products (HLSL30_VI and HLSS30_VI) through Earthdata Search.</p>
<u>Data - Harmonized Landsat Sentinel 2</u>	<p>Webpage that provides information on ways to access HLS data, including information on the HLS Vegetation Index Suite.</p>

Use Case and Application Examples

This category's resources provide examples of the solution in-use as well as other potential scientific applications of the data.

<u>Normalized Difference Vegetation Index (NDVI) Visualizations using HLS Data</u>	<p>Time series visualizations of HLS NDVI showing how the vegetation index compares reflectances of near-infrared (NIR) and red light. In each visualization, healthy vegetation is represented by the color green, and red is indicative of bare soil.</p>
<u>HLS Time Series Data to Detect Irrigated Areas: An Application in Southern Italy</u>	<p>Publication describing a framework for using images from the HLS dataset to track NDVI changes over time and map the extent of irrigated areas in Southern Italy.</p>
<u>Characterizing Land Surface Phenology and Exotic Annual Grasses in Dryland Ecosystems Using Landsat and Sentinel-2 Data in Harmony</u>	<p>Publication demonstrating the use of HLS-derived NDVI for mapping invasive annual grasses in the western United States.</p>

<p><u>Exploring NASA's HLS Dataset to Monitor Deforestation in the Amazon Rainforest</u></p>	<p>Publication examining the use of HLS to monitor deforestation in the Amazon Rainforest utilizing NDVI, the Enhanced Vegetation Index (EVI), and the Soil-Adjusted Vegetation Index (SAVI), all three included in the HLS-VI suite, as well as the Global Environment Monitoring Index (GEMI).</p>
<p><u>Spectral Indices for Land and Aquatic Applications</u></p>	<p>Tutorial provided by NASA ARSET for calculating spectral indices from the Landsat 9 Operational Land Imager (OLI)-2, Sentinel-2 Multi-spectral Instrument (MSI), and HLS data.</p>

Contact Information

Need additional help using this solution? Let us know what gaps or questions still exist, what tools interest you, and/or how you want to apply this solution. We are happy to connect you with more information and ongoing efforts to fill those gaps. Contact us at info@snwg-impact.net.