

Metadata Standard for the National Spectral Database

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Following phase 1 of the DEA surface reflectance validation field campaign and building on past campaigns and research into metadata quality, a metadata standard (the “Standard”) is established to ensure that future data entered into the National Spectral Database (“NSD”) is useful to as wide a range of audience as possible, and meets a minimum set of metadata parameters.

This work builds on metadata quality standards established through Milton et al., 2007; Held et al., 2015; Rasaiah et al., 2015; Aasen et al., 2017 as well as field work and record keeping standards from the ARD Calibration and Validation team at Geoscience Australia.

Minimum Metadata Parameters - Threshold Parameters

These form the basis by which spectral data are deemed suitable for the NSD. Without these parameters datasets are deemed unsuitable for the NSD and such datasets will be reviewed or removed.

Threshold Metadata Parameter	Specchio Parameter
General Project Information	<p>Campaign name (project name) - Specchio requires a name to be specified when ingesting data. This could be the over-arching institute, a location of a study or a brief study description (ie “GA”, or “Geoscience Australia”, or “Tree-species end-member study 2017”).</p> <p>Project owner – name and contact email. Users who wish to publish data may need to contact the campaign owner.</p>
Location Information	Latitude & longitude
	Location name, target description - (for end-member or aquatic data, the location name and end-member description is acceptable in place of GPS co-ordinates where appropriate)
Date and Time of Measurement	<p>Acquisition time (UTC) ie</p> <p>MM/DD/YYYY HH:MM:SS or</p> <p>MM-DD-YYYY HH:MM:SS 24hr</p> <p>*for DN data, accuracy to at least the minute</p>

Instrument Calibration File	Instrument calibration data file, added to the campaign at root / base level *for DN data
Reference Panel Measurement	Uploaded spectral measurement of at least one panel reading or a cosine diffuser (or alternate panel measurement) per data set or time period *for both DN and radiance data

Time has not been made a threshold value for reflectance and radiance data as there is still some potential value to users as long as other threshold metadata are present. As a minimum the GA NSD will require reflectance data, or DN and radiance data with associated files such that reflectance data may be generated. Reflectance data requires as a minimum location information.

Core Parameters

Where possible, these parameters should be included for a spectral dataset and are built on works from Rasaiah et al., 2015 and Held et al., 2015. This list is not exhaustive, and extra metadata outside those described below should be added in Specchio where possible. A full list of metadata that can be added to Specchio is available in the user guide:
https://github.com/SPECCHIODB/Guides/raw/master/SPECCHIO_UserGuide.pdf

The most current metadata list can be retrieved from the Specchio application, by selecting the Help menu and then List Available Metadata Elements. This is all available metadata fields currently supported by the GA NSD, and cover RPAS and Aquatic acquisitions additionally to base spectral metadata.

The metadata fields shown in the Specchio user guide should be a reference as to the “gold” standard for metadata in the NSD. It is unreasonable to require every metadata field in this guide be populated for every spectra in the database, but can be used as a basis to design future study/field sheets. The full list of metadata fields should be considered on a study-by-study basis, with relevant information captured as metadata that reasonably adds quality to the dataset.

Core Metadata Parameters	Specchio Parameter
General Project Information	Campaign name (Project name)
	Link to study website, project participants (people/institute), project owner (name and contact email)
	Study / project description
Location Information	Latitude & longitude

Location Information (cont.)	Location name, target / location / substrate description, understorey/bare ground description where applicable
	Sampling height / depth (ie for drone or underwater surveys, relative to ground level or sea level as applicable)
	Sampling photos (environment, setup, sky and target)
	Altitude / elevation - applicable to terrestrial field surveys. Altitude is optional, depending on data type. It makes sense to include altitude with radiance measurements for potential atmospheric correction calculations
Date and Time of Measurement	Date / time (UTC)
Atmospheric Conditions	% cloud cover
	Relative humidity
	Wind speed and direction
	Sky conditions* (clouds / cloud type / sky colour / haze / wind) – when appropriate
Instrument	Instrument description (make/model no., ie what was used to capture the data)
	Time since last dark signal correction, Integration time, mode
	Gain settings, signal averaging
	“Recent” calibration file, as recent as possible
Viewing Geometry	Distance to target
	Illumination zenith/azimuth

	Sensor zenith/azimuth
	Description of reflectance factor ie Biconical (BRF) / Conical-hemispherical (CHRF) / Hemispherical – conical (HCRF) / Bi-hemispherical (BHRF) – see Milton et al.
Hyperspectral Signal Properties	Data type/measurement type (radiance, reflectance, DN etc, also automatically determined by Specchio upon ingestion)
	Wavelength interval
Reference Standard	Whether a reference was used, the material and serial number of reference material
Illumination Information	Source of illumination (solar / external)

References

Milton, E.; Schaepman, M.E.; Anderson, K.; Kneubuehler, M.; Fox, N. Progress in field spectroscopy. *Remote Sensing of Environment* 113 Suppl. **2009**, 1. 113. 10.1016/j.rse.2007.08.001.

Held, A., Phinn, S., Soto-Berelov, M., & Jones, S. (Eds.). AusCover Good Practice Guidelines: A technical handbook supporting calibration and validation activities of remotely sensed data products. **2015**. Version 1.1. TERN AusCover, ISBN 978-0-646-94137-0

Rasaiah, B.A.; Jones, S.D.; Bellman, C.; Malthus, T.J.; Hueni, A. Assessing Field Spectroscopy Metadata Quality. *Remote Sens.* **2015**, 7, 4499-4526.

Aasen, H.; Hueni, A.; Machwitz, M.; Malenovsky, Z.; Mallick, K.; Paul-Limoges, E.; Schlerf, M.; Schneider, F.D.; Suárez, L.; Van Wittenberghe, S.; Wieneke, S.; Wolf, S. Ecosystem specific Metadata. **2017**, 10.13140/RG.2.2.14986.77761.

Malthus, T.; Ong, C.; Lau, I.; Fearn, P.; Byrne, G.; Thankappan, M. A Community Approach to the Standardised Validation of Surface reflectance Data (Draft). **2019**, CSIRO.