

## EUFR - Standards and Protocols (N7SP)

# Glossary

S. Holzwarth, 7 - DLR  
O. Henry, 1 - MF-CNRM

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## Abbreviations

### A

**a.g.l.** above ground level

**a.s.l.** above sea level

**AARP** Airborne Aerosol Research Pod

**AATS** NASA Ames Airborne Tracking Sunphotometer

**AC** Alternating Current

**ACCENT** Atmospheric Composition Change the European NeTwork

**ACCENT Plus** Atmospheric Composition Change the European NeTwork plus

**ACE** Aerosol Characterization Experiment

**ACTOS** Airborne Cloud Turbulence Observation System

**ACTRIS** Aerosols, Clouds, and Trace gases Research InfraStructure

**ADC** Analogue Digital Converter

**AHS** Airborne Hyperspectral Sensor (imaging spectrometer)

**AIDA** Aerosol Interaction And Dynamics In The Atmosphere

**AIMMS** Aircraft-Integrated Meteorological Measurement System

**AIRFLEX** Airborne photometer

**AIRTOSS** AIRcraft TOWed Sensor Shuttle

**AIS** Airborne Imaging Spectrometer

**AISA** Airborne Imaging Spectrometer for Applications (imaging spectrometer)

**ALIDS** Airborne Laser Interferometric Drop Sizer

**AMAX-DOAS** Airborne Multi Axis Differential

**AMMA** African Monsoon Multidisciplinary Analysis

**AMS** Aerosol Mass Spectrometer

**AMSU** Advanced Microwave Sounding Unit

**AOD** Aerosol Optical Depth

**AOS** Acousto Optical Spectrometer

**APD** Avalanche Photodiode

**APEX** Airborne Prism Experiment (imaging spectrometer)

**APM** Aerodynamic Particle Mass Analyzer

**APS** Aerodynamic Particle Sizer

**ARM** Atmospheric Radiation Measurements  
**ASASP** Active Scattering Aerosol Spectrometer Probe  
**ASD** Analytical Spectral Devices  
**ASI** Airborne Spectral Imager  
**ASMM** Airborne Science Mission Metadata creator  
**ASSP** Axially Scattering Spectrometer Probe  
**ASTAR** Arctic Study of Tropospheric Aerosol, Clouds and Radiation  
**ATBD** Algorithm Theoretical Basis Document  
**ATCOR** Atmospheric and Topographic Correction  
**ATDD** Atmospheric Turbulence and Diffusion Division  
**ATM** ATM Airborne Thematic Mapper  
**AU** Astronomical Unit  
**AUX** Auxiliary Data  
**AVIRIS** Airborne Visible Infrared Imaging Spectrometer (imaging spectrometer)  
**AWI** Alfred Wegener Institute für Polar und Meeresforschung (DE) - EUFAR Partner

## B

**BAT** Best Aircraft Turbulence  
**BBCRDS** Broadband Cavity Ring-Down Spectroscopy  
**BC** Black Carbon  
**BCP** Backscatter Cloud Probe  
**BHR** Bi-Hemisphere Reflection  
**BIL** Band Interleaved by Line  
**BOA** Bottom Of Atmosphere  
**BRDF** Bidirectional Reflectance Distribution Function  
**BRF** Bidirectional Reflectance Factors  
**BSQ** Band SeQuential  
**BSRN** Baseline Surface Radiation Network

## C

**CAL** Calibration  
**CARIBIC** Civil Aircraft for Regular Investigation of the Atmosphere Based on an Instrument Container  
**CAS** Cloud and Aerosol Spectrometer  
**CAS-DPOL** Cloud and Aerosol Spectrometer With Depolarization  
**CASI** Compact Airborne Spectrographic Imager

<b>CBL</b>	Convective Boundary Layer
<b>CCD</b>	Charge-Coupled Device
<b>CCN</b>	Cloud Condensation Nuclei
<b>CCNC</b>	Cloud Condensation Nucleus Counter
<b>CCRF</b>	Chemical Conversion Resonance Fluorescence
<b>CCRS</b>	Canadian Center for Remote Sensing
<b>CDMA</b>	Cylindrical Differential Mobility Analyzer
<b>CDP</b>	Cloud Droplet Probe
<b>CE</b>	Collection Efficiency
<b>CEAS</b>	Cavity Enhanced Absorption Spectroscopy
<b>CEOS</b>	Committee of Earth Observation Satellites
<b>CEP</b>	Cloud Extinction Probe
<b>CFD</b>	Computational Fluid Dynamics
<b>CFDC</b>	Continuous Flow Diffusion Chamber
<b>CFMC</b>	Continuous Flow Mixing Chamber
<b>CHB</b>	Calibration Home Base
<b>CHRIS</b>	Compact High-Resolution Imaging spectrometer
<b>CIMS</b>	Chemical Ionization Mass Spectrometer
<b>CIN</b>	Cloud Integrating Nephelometer
<b>CIP</b>	Cloud Imaging Probe
<b>CIRA</b>	Centro Italiano Ricerche Aerospaziali
<b>CL</b>	Chain Length
<b>CLH</b>	Closed Path TDL Hygrometer
<b>CMOS</b>	Complementary Metal Oxide Semiconductors
<b>CNR</b>	Consiglio Nazionale delle Ricerche (IT) - EUFAR Partner
<b>CNRS</b>	Centre National de Recherche Scientifique (FR) - EUFAR Partner
<b>COPAL</b>	COMMunity heavy-PAYload Long endurance instrumented aircraft for tropospheric research in environmental and geo-sciences
<b>COSSIR</b>	Conical Scanning Millimeter-Wave Imaging Radiometer
<b>CP</b>	Carrier Phase
<b>CPC</b>	Condensation Particle Counter
<b>CPI</b>	Cloud Particle Imager
<b>CPSD</b>	Cloud Particle Spectrometer With Depolarization
<b>CRDS</b>	Cavity Ring-Down Spectroscopy

**CRISM** Compact Reconnaissance Imaging Spectrometer

**CSI** Cloud Spectrometer and Impactor

**CTA** Constant Temperature Anemometer

**CVGZ** CzechGlobe ,Centrum Výzkumu Globální Změny AV ČR (CZ) - EUFAR Partner

**CVI** Counterflow Virtual Impactor

**CW** Continuous Wave

## **D**

**DAIS** Digital Airborne Imaging Spectrometer

**DC** Dark Current

**DDV** Dense Vegetation Approach

**DEM** Digital Elevation Model

**DFG** Deutsche Forschungsgemeinschaft

**DGNSS** Differential GNSS

**DGPS** Differential GPS

**DLR** Deutsches Zentrum für Luft- und Raumfahrt e.V. (DE) - EUFAR Partner

**DMA** Differential Mobility Analyzer

**DMPS** Differential Mobility Particle Sizer

**DMS** Differential Mobility Spectrometer

**DMT** Droplet Measurement Technologies

**DN** Digital Number

**DNU** Digital Number Unit

**DOE** Department of Energy

**DOF** Depth Of Field

**DOP** Dilution Of Precision

**DOY** Day Of the Year

**DRI** Desert Research Institute

**DSD** Drop Size Distribution

**DSM** Digital Surface Model

**DTM** Digital Terrain Model

**DU** Dobson Units

**DUE** Data Uncertainty Engine

## **E**

**EARSel** European Remote Sensing Laboratories

**EAS** Electrical Aerosol Spectrometer  
**EC** Environment Canada  
**EC** European Commission  
**eCL** effective Chain Length  
**ECN** Netherlands Energy Research Foundation  
**ECSS** European Cooperation for Space Standardisation  
**EEPS** Engine Exhaust Particle Sizer  
**EGADS** EUFAR General Airborne Data-processing Software  
**EL** Empirical Line  
**EM** End Member  
**EMC** EUFAR Metadata Creator  
**EnMAP** Environmental Mapping and Analysis Programme  
**Enviscope** enviscope GmbH, Messtechnik für Umweltforschung (DE) - EUFAR Partner  
**ENVRI** ENVIRONMENTAL RESEARCH INFRASTRUCTURES  
**ENVRIplus** ENVIRONMENTAL RESEARCH INFRASTRUCTURES plus  
**EO** Earth Observation  
**ESA** European Space Agency  
**ESG** Electrically Suspended Gyroscope  
**ESR** Electron Spin Resonance  
**EUCAARI** European Aerosol Cloud Climate and Air Quality Interactions  
**EUFAR** European Facility for Airborne Research  
**EWG** Expert Working Group (EUFAR term)

**F**

**FAAM** Facility for Airborne Atmospheric Measurements - EUFAR Partner  
**FADS** Flush Airdata Sensing  
**FCDP** Fast CDP  
**FFRDC** Federally Funded Research and Development Center  
**FFSSP** Fast FSSP  
**FHP** Five-Hole Probe  
**FIMS** Fast Integrated Mobility Spectrometer  
**FINCH** Fast Ice Nucleus Chamber  
**FISH** Fast In Situ Stratospheric Hygrometer

**FLAASH** Fast Line-of-sight Atmospheric Analysis of Spectral Hypercubes

**FLI** Fluorescence Line Imager

**FODIS** Fibre Optic Downwelling Irradiance Sensor

**FOG** Fiber Optic Gyro

**FOV** Field Of View

**FPA** Focal Plane Array

**FPGA** Field Programmable Gate Array

**FSSP** Forward Scattering Spectrometer Probe

**FTS** Fourier Transform Spectrometer

**FUB** Freie Universität Berlin (DE) - EUFAR Partner

**FWHM** Full Width at Half Maximum

## G

**GAW** Global Atmospheric Watch

**GC-MS** Gas Chromatography–Mass Spectrometry

**GCP** Ground Control Point

**GER** Geophysical and Environmental Research Corporation

**GFC** Gas Filter Correlation

**GHG** Greenhouse Gases

**GIS** Geographic Information System

**GLONASS** Globalnaja Navigaziona Sistema

**GloPac** Global Hawk Pacific Mission

**GNSS** Global Navigation Satellite Systems

**GPS** Global Positioning System

**GSD** Ground Sampling Distance

## H

**HALO** High Altitude and Long Range Research Aircraft

**HDF** Hierarchical Data Format

**HDRF** Hemisphere Diffuse Reflectance Function

**HIAPER** High-performance Instrumented Airborne Platform for Environmental Research

**HIPPO** Pole-to-Pole Observations

**HISS** Hyper Image Space Spectrometer

**HOLODEC** Holographic Detector For Clouds

**HPC** High Performance Computing  
**HPD** Hybrid Photodetector  
**HRS** Hyperspectral Remote Sensing  
**HTW** Harvard Total Water Hygrometer  
**HVPS** High Volume Precipitation Spectrometer  
**HW** HardWare  
**HyMap** Hyperspectral Mapper  
**HYRESSA** HYperspectral REMote Sensing in Europe specific Support Actions (FP6 project)

**I**

**IAGOS** In-Service Aircraft for a Global Observing System  
**IC** Ion Chromatography  
**ICAO** International Civil Aviation Organization  
**ICARTT** Intercontinental Consortium for Atmospheric research on Transport and Transformation  
**ICOS** Integrated Cavity Output Spectroscopy  
**ICPS** Isokinetic Cloud Probe System  
**IDI** Isokinetic Diffuser-Type Inlet  
**IDL** Interactive Data Language  
**IF** Intermediate Frequency  
**IFOG** Interferometric Gyro  
**iFOV** instantaneous Field Of View  
**IfT** Leibniz Institute for Tropospheric Research  
**IKP** Isokinetic TWC Probe  
**ILIDS** Interferometric Laser Imaging for Droplet Sizing  
**ILS** Instrument Line Shape  
**IMU** Inertial Measurement Unit  
**IN** Ice Nuclei  
**INAA** Instrumental Neutron Activation Analysis  
**INDOEX** Indian Ocean Experiment  
**INS** Inertial Navigation System  
**InS** Indium Antimonide  
**INSPECTRO** Influence of clouds on the SPectral actinic flux in the lower TROposphere  
**INSPIRE** Infrastructure for Spatial Information in Europe  
**INTA** Instituto Nacional de Técnica Aeroespacial (ES) - EUFAR Partner

**IPCC** Intergovernmental Panel on Climate Change

**IR** Infra- Red

**IRS** Inertial Reference System

**IS** Imaging Spectroscopy

**ISA** International Standard Atmosphere

**ISIS** International Spaceborne Imaging Spectroscopy

**ISO** International Organization for Standardization

**ITRES** Integral Technology for Remote Sensing

**ITS** International Temperature Scale

**IWC** Ice Water Content

**IWP** Ice Water Path

**IWV** Integrated Water Vapor

**J**

**JRA** Joint Activity Research (EUFAR term)

**K**

**KIT** Karlsruher Institut für Technologie (DE) - EUFAR Partner

**L**

**LACE** Lindenberg Aerosol Characterization Experiment

**LAI** Leaf Area Index

**LaMP** Laboratoire de Météorologie Physique

**LANDSAT** Land Satellite

**LDV** Laser-Doppler Velocimetry

**LED** Light Emitting Diode

**LIDAR** Light Detection and Ranging

**LIF** Laser Induced Fluorescence

**LIM** Leipzig Institute for Meteorology

**LNA** Low Noise Amplifiers

**LO** Local Oscillator

**LPAS** Laser-induced Photo-Acoustic Spectrometry

**LPM** Liter Per Minute

**LSF** Line Spread Function

**LTi** Low Turbulence Inlet

**LULC** Land Use Land Cover

**LUT** Look-Up Table

**LWC** Liquid Water Content

**LWP** Liquid Water Path

**M**

**MAAP** Multi-Angle Absorption Photometer

**MARSS** Microwave Airborne Radiometer Scanning System

**MAS** Moderate Resolution Imaging Spectroradiometer

**MASI** Midwave Airborne Spectral Imager

**MASP** Multiangle Aerosol Spectrometer

**MCP** Multichannel Plate

**MCS** Multichannel Spectrometer

**MCT** Mercury Cadmium Telluride

**MEMS** Microelectomechanical System

**MetOffice** Met Office (UK) - EUFAR Partner

**MF-CNRM** Meteo-France, Centre National de Recherches Meteorologiques (FR) - EUFAR Partner

**MIR** Mid Infrared

**MIVIS** Multispectral Infrared and Visible Imaging Spectrometer

**MLS** Microwave Limb Sounder

**MNF** Minimum Noise Fraction

**MODIS** Moderate Resolution Imaging Spectroradiometer

**MODTRAN** Moderate Resolution Transmission Code

**MOZAIC** Measurement of Ozone and Water Vapor by Airbus In-Service Aircraft

**MPI** Max Planck Institute

**MSL** Mean Sea Level

**MSU** Microwave Sounding Unit

**MTF** modulation transfer function

**MVD** Median Volume Diameter

**MW** Microwave

**MWIR** Midwave infrared

**N**

**NA** Numerical Aperture

**NASA** National Aeronautics and Space Administration

**NCAR** National Center for Atmospheric Research

**NDI** Nested Diffuser-Type Inlet

**NDIR** Non-Dispersive Infrared

**NDVI** Normalized Difference Vegetation Index

**NED** North-East-Down

**NedT** noise equivalent delta temperature

**NEO** Norsk Elektro Optikk

**NER** noise equivalent radiance

**NERC** Natural Environment Research Council (UK) - EUFAR Partner

**NetCDF** Network Common Data Form

**NIR** Near infrared

**NSF** National Science Foundation

## O

**OAP** Optical Array Probe

**OC** Organic Carbon

**OCTS** Ocean Colour and Temperature Sensor

**ODE** Ozone Depletion Event

**OMAC** Opposed Migration Aerosol Classifier

**ONERA** Office National d'Etudes et de Recherches Aérospatiales (FR) - EUFAR Partner

**OPC** Optical Particle Counter

## P

**PAF** Processing and archiving facility

**PALMS** Particle Analysis by Laser Mass Spectrometer

**PC-BOSS** Particle Concentrator-Brigham Young University Organic Sampling System

**PCA** Principle Component Analysis

**PCASP** Passive Cavity Aerosol Spectrometer Probe

**PDA** Phase Doppler Analyzer

**PdA** Photodiode Array

**PDI** Phase Doppler Interferometer

**PDPA** Phase Doppler Particle Analyzer

**PeRCA** Peroxy Radical Chemical Amplification

**PFA** Paraformaldehyd

**PGP** Prism-Grating-Prism

<b>PH-CPC</b>	Pulse-Height CPC
<b>PILS</b>	Particle-Into-Liquid Sampler
<b>PIP</b>	Precipitation Imaging Probe
<b>PIXE</b>	Particle-Induce X-Ray Emission
<b>PM1</b>	Particulate Matter with Particle Diameter < 1.0 $\mu\text{m}$
<b>PM2.5</b>	Particulate Matter with Particle Diameter < 2.5 $\mu\text{m}$
<b>PMI</b>	Programmable Multi-Spectral Imager
<b>PML</b>	Plymouth Marine Laboratory (UK) - EUFAR Partner
<b>PMS</b>	Particle Measuring Systems
<b>PMT</b>	Photomultiplier Tube
<b>PN</b>	Polar Nephelometer
<b>PPS</b>	Pulse Per Second
<b>Pr</b>	Prandtl Number
<b>PRISM</b>	Processes Research for Imaging Spectrometer Mission
<b>PROBA</b>	Project for On-Board Autonomy
<b>PSA</b>	Particle Surface Area
<b>PSAP</b>	Particle Soot Absorption Photometer
<b>PSD</b>	Particle Size Distribution
<b>PSF</b>	Point Spread Function
<b>PSL</b>	Polystyrene Latex Beads
<b>PSM</b>	Particle Size Magnifier
<b>PSR</b>	Polarimetric Scanning Radiometer
<b>PSU</b>	Pennsylvania State University
<b>PTFE</b>	Polytetrafluorethyle
<b>PToF</b>	Particle Time-of-Flight
<b>PTR-MS</b>	Proton Transfer Reaction Mass Spectrometer
<b>PVM</b>	Particle Volume Monitor
<b>Q</b>	
<b>QA</b>	Quality Assurance
<b>QCL</b>	Quantum Cascade Laser
<b>QI</b>	Quality Indicator
<b>QL</b>	Quality Layer
<b>QPF</b>	Quantitative Precipitation Forecast

**QUAC** Quick Atmospheric Correction

**R**

**RADAR** Radio Detection and Ranging

**RAOS** Reno Aerosol Optics Study

**RCC(r,c)** Radiometric calibration coefficient for the pixel at row r and column c

**RDMA** Radial Differential Mobility Analyzer

**Re** Reynolds Number

**REO** Research Electro-Optics

**RF** Radio Frequency

**RH** Relative Humidity

**RICO** Rain in Cumulus Over the Ocean

**RID** Rosemount Icing Detector

**RLG** Ring Laser Gyro

**RMS** Root Mean Square

**RONOCO** Role of Nighttime Chemistry in Controlling the Oxidizing Capacity of the Atmosphere

**ROSI** Reflective Optics System Imaging Spectrometer (imaging spectrometer)

**RSL** Remote Sensing Laboratory

**RSR** Relative Spectral Response

**RT** Receiver Transmitter

**S**

**SA** Selective Availability

**SAGE** Stratospheric Aerosol and Gas Experiment

**SAM** Spectral Angle Mapper

**SAR** Synthetic Aperture RADAR

**SAW** Surface Acoustic Wave

**SBET** Smoothed Best Estimated Trajectory

**SCD** Slant Column Densities

**SDI** Solid Diffuser-Type Inlet

**SEA** Science Engineering Associates

**SEMS** Scanning Electrical Mobility Spectrometer

**SFSI** Short-Wave IR Full Spectrum Imager

**SHIVA** Stratospheric Ozone:Halogen Impacts in a Varying Atmosphere

**SID** Small Ice Detector

<b>SMART</b>	Spectral Modular Airborne Radiation system
<b>SMIRR</b>	Shuttle Multispectral Infrared Radiometer
<b>SMPS</b>	Scanning Mobility Particle Sizer
<b>SNR</b>	Signal-To-Noise Ratio
<b>SOLVE</b>	SAGE III Ozone Loss and Validation Experiment
<b>SP-2</b>	Single Particle Soot Photometer
<b>SPEC</b>	Stratton Park Engineering Company
<b>SPECIM</b>	Spectral Imagers
<b>SPIN</b>	Spectrometer for Ice Nuclei
<b>SPIRIT</b>	Spectrometre Infra Rouge In situ
<b>SPOT</b>	System Probatoire d'Observation de la Terre
<b>SRTM</b>	Shuttle Radar Topography Mission
<b>SSFR</b>	Solar Spectral Flux Radiometer
<b>SSMI/S</b>	Special Sensor Microwave Imager/Sounder
<b>SST</b>	Sea Surface Temperature
<b>SSTI</b>	Small Satellite Technology Initiative
<b>STD</b>	STandard Deviation
<b>STFC</b>	Science and Technology Facilities Council (UK) - EUFAR Partner
<b>Stk</b>	Stokes Number
<b>STP</b>	Standard Temperature and Pressure
<b>STRAP</b>	Stabilized Radiometer Platform
<b>SV</b>	Satellite Vehicle
<b>SVM</b>	Support Vector Machine
<b>SW</b>	SoftWare
<b>SWE</b>	Snow Water Equivalent
<b>SWIR</b>	ShortWave Infra-Red
<b>T</b>	
<b>TA</b>	Transnational access (EUFAR term)
<b>TARFOX</b>	Tropospheric Aerosol Radiative Forcing Observational Experiment
<b>TAS</b>	True Air Speed
<b>TASI</b>	Thermal Airborne Spectral Imager
<b>TAU</b>	Tel Aviv University (IL) - EUFAR Partner
<b>TDL</b>	Tunable Diode Laser

**TEC** Total Electron Content

**TexAQS** Texas Air Quality Study

**TIMS** Thermal Infrared Multispectral Scanner

**TIR** Thermal Infra-Red

**TLAS** Tunable Laser Absorption Spectroscopy

**TM** Thematic Mapper

**TOA** Top Of Atmosphere

**ToF** Time-of-Flight

**TOPSE** Tropospheric Ozone Production about the Spring Equinox

**TOR** Thermal-Optical Reflectance

**TU Vienna** Technische Universitat Wien (AT) - EUFAR Partner

**TWC** Total Water Content

**U**

**UAS** Unmanned Aerial Systems

**UAV** Unmanned Aerial Vehicle

**UCAR** University Corporation for Atmospheric Research

**UEDIN** The University of Edinburgh (UK) - EUFAR Partner

**UFT** Ultra Fast Thermometer

**UHSAS** Ultrahigh Sensitivity Aerosol Spectrometer

**UK** United Kingdom

**UK-MRF** United Kingdom Meteorological Research Flight

**UKMO** United Kingdom Meteorological Office

**ULEI** University of Leipzig (DE) - EUFAR Partner

**UNAM** Universidad Nacional Autonoma de Mexico

**UNIVLEEDS** The University of Leeds (UK) - EUFAR Partner

**UPA** Uncertainty Propagation Analysis

**US** United States

**USAS** Ultrahigh Sensitivity Aerosol Spectrometer

**UT/LS** Upper Troposphere/Lower Stratosphere

**UTC** Universal Time Coordinated (UTC)

**UTM** Universal Transverse Mercator (UTM)

**UV** UltraViolet

**UWAR** University of Warsaw (PL) - EUFAR Partner

**UZH** Universität Zürich (CH) - EUFAR Partner

**V**

**VAD** Velocity Azimuth Display

**VAL** Validation

**VBA** Vibrating Beam Accelerometer

**VIPS** Video Ice Particle Sampler

**VIS** Visible

**VITO** Vlaamse Instelling voor Technologisch Onderzoek (BE) - EUFAR Partner

**VNIR** Visible and Near Infra-Red

**VOC** Volatile Organic Compound

**VOCALS** VAMOS Ocean-Cloud-Atmosphere-Land Study

**VSLs** Very Short-Lived Substances

**VUV** Vacuum Ultraviolet

**W**

**WAS** Whole Air Sampler

**WGS84** World Geodetic System 1984

**WICC** Wide Stream Impaction Cloud Water Collector

**WMO** World Meteorological Organization

**WP** Work Package

**X**

**XML** eXtensible Markup Language

**XRF** X-Ray Fluorescence

## Terms

### A

**aberration** Spatial error of projecting an object at the surface of the earth.

**absorption** The process by which electromagnetic radiation is assimilated and converted into other forms of energy, primarily heat. Absorption takes place only on the electromagnetic radiation that enters a medium, and not on electromagnetic radiation incident on the medium but reflected at its surface.

**absorption band** A range of wavelengths (or frequencies) of electromagnetic radiation that is assimilated by a substance.

**ACCENT Plus** Atmospheric Composition Change The European NeTwork. The general concept for ACCENT-Plus is to extend the breadth of ACCENT to reach out more strongly to the policy community to facilitate the transfer of research results into policy development and decision making.

**ACTRIS** Aerosols, Clouds, and Trace gases Research InfraStructure. The ACTRIS-2 Integrating Activities (IA) addresses the scope of integrating state-of-the-art European ground-based stations for long-term observations of aerosols, clouds and short lived gases. It consolidates and improves services offered within FP7 funded Integrated Infrastructures Initiative ACTRIS (2011-2015). ACTRIS-2 takes up the overarching objectives of ACTRIS to further integrate the European ground-based stations and to construct a user-oriented RI, unique in the EU-RI landscape, for aerosols, clouds, and short-lived gas-phase species.

**adjacency effect** Influence of adjacency radiation (atmospheric and volume backscattering) to the total radiance signal.

**aerosol** The term is used to describe many types of small particles in the atmosphere that both absorb and reflect incoming sunlight.

**albedo** The ratio of the amount of electromagnetic energy reflected by a surface to the amount of energy incident upon it.

**altitude** Height above a datum, the datum usually being mean sea level.

**aperture** An opening that admits electromagnetic radiation to a film or detector. An example would be the lens diaphragm opening in a camera.

**at-sensor radiance** Radiance at the entrance aperture of an optical instrument.

**atmospheric correction** The correction made to remotely sensed radiance to reduce or normalize for the intervening atmosphere between the surface of the earth and the sensor.

**atmospheric window** The range of wavelength of the electromagnetic spectrum at which the atmosphere and atmospherically gases respectively only slightly absorbs radiation.

**attitude** Angular orientation of the sensor system (see also roll, pitch, yaw).

**attribute** A descriptive parameter attached to a data variable e.g. units, valid range, etc

**auxiliary data (aux)** Data required to perform processing of sensor data which is not obtained from the sensor itself.

**azimuth** The arc of the horizon measured clockwise from true north to the point referenced expressed in degrees.

### B

**backscatter** Scattering of radiation (or particles) through angles greater than 90° with respect to the original direction of motion.

**band-to-band co-registration** Describes the geometric matching of different spectral bands of one image or scene.

**bandwidth** Width of a spectral feature as measured by a spectroscopic instrument.

**batch processing** Pertaining to the technique of executing a set of computer programs such that each program of the set is completed before the next program of the set is started; loosely, sequential processing.

**bidirectional reflectance** A unitless measure of the ratio of incoming to outgoing radiation created from converting a radiometrically calibrated image to an innate characteristic of the target being observed. After removing the atmospheric component of calibrated at-satellite spectral radiance, bidirectional reflectance distribution functions (BRDFs), bidirectional reflectance, and bidirectional reflectance factors (BRF) attempt to take into account target-related differences in reflectance as a function of four sources of variability of non-Lambertian surfaces: solar zenith and azimuthal irradiance angles and sensor viewing zenith and azimuthal angles.

**BIL** Band Interleaved by Line. A common data format used in hyperspectral remote sensing where the pixel information is stored band by band for each line.

**black body** An ideal body which, if it existed, would be a perfect absorber and a perfect radiator, absorbing all incident radiation, reflecting none, and emitting radiation at all wavelengths.

**boresight alignment** A process of adjusting the optical axis to the centre of the Field of View.

**BRDF** Bidirectional Reflectance Distribution Function (see bidirectional reflectance)

**BRF** Bidirectional Reflectance Factors (see bidirectional reflectance)

**BSQ** Band SeQUential. A common data format used in hyperspectral remote sensing where the data is stored band by band.

## C

**calibration (cal)** The process of determining values and accuracies to sensor parameters allowing a comparison of sensor measurements with reference values.

**calibration data** In remote sensing, measurements pertaining to the spectral or geometric characteristics of a sensor or radiation source.

**campaign** Realization of several surveys within a given time period.

**channel** A channel is the abundance of data containing one spectral sensitive wavelength range of the sensor acquired during a specific time period and represents a two dimensional array of data with a spatial and time dimension.

**characterization** The process of determining parameters of a sensor or sensor system necessary to operate it in a given environment and interpret its measurements.

**COPERNICUS** Copernicus, previously known as GMES (Global Monitoring for Environment and Security), is the European Programme for the establishment of a European capacity for Earth Observation.

**coverage** Total area of the Earth surface that can potentially be mapped within a given time frame.

**cross-calibration** The comparison of one sensor to another sensor on different aircraft.

## D

**dark current (DC)** Dark current is one of the main sources of noise in image sensors.

**data acquisition** Time span, when data are recorded.

**data archive** A facility providing storage, preservation, disposition and distribution of data sets and associated metadata.

**data processing** Radiometric, atmospheric and geometric correction of sensor data in order to derive information or prepare this data for deriving knowledge.

**data product** General term to indicate raw data, validation data, auxiliary data, fast delivery, regenerated, or precision products.

**data provider** Any institution offering access to data required over area of interests determined by a user.

**de-striping** Process that removes the systematic striping or banding that often occurs in multispectral scanners

**derived product** A data product generated by using an algorithm or model to create a higher level product

**detector** A device that detects and linearly transduces radiative power into an electrical signal.

**digital elevation model (DEM)** A representation of the topography of the Earth in digital format, that is, by coordinates and numerical descriptions of altitude.

**digital surface model (DSM)** A representation of the topography of the Earth including buildings, vegetation, natural terrain features, etc. in digital format, that is, by coordinates and numerical descriptions of altitude.

**digital terrain model (DTM)** see digital elevation model (DEM)

**distortion** A change in scale from one part of an image to another.

**dynamic range** Range of At-Sensor Radiances to be measured within the linear response of the instrument from a minimum to a maximum at-sensor radiance level.

## E

**electromagnetic radiation** Energy emitted as a result of changes in atomic and molecular energy states and propagated through space at the speed of light, i.e., energy transfer in the form of electromagnetic waves or particles that propagate through any medium at the speed of light.

**electromagnetic spectrum** The entire range of electromagnetic radiation according to wavelength that moves at a constant velocity of light.

**emissivity** The ratio of radiant flux emitted by a surface to that emitted by a blackbody at the same temperature.

**empirical line calibration** Empirical line (EL) calibration forces the image spectra to match reflectance spectra collected from the field. This requires the identification of at least two homogenous targets of contrasting reflectances.

**end-user** Anyone interpreting thematic information extracted from data.

**ENVRI** ENVironmental Research Infrastructures. The central goal of the ENVRI project is to implement harmonised solutions and draw up guidelines for the common needs of the environmental ESFRI projects, with a special focus on issues as architectures, metadata frameworks, data discovery in scattered repositories, visualisation and data curation.

**ENVRIplus** ENVironmental Research Infrastructures plus. ENVRIplus is a Horizon 2020 project bringing together Environmental and Earth System Research Infrastructures, projects and networks together with technical specialist partners to create a more coherent, interdisciplinary and interoperable cluster of Environmental Research Infrastructures across Europe.

**EUROFLEETS2** New operational steps towards an alliance of European research fleets. Aiming at consolidating the construction of a pan-European distributed research fleet infrastructure with common strategic vision and coordinated access to European marine research vessels and equipment. The EUROFLEETS2 is a Research Infrastructures project under the 7th Framework Programme of the European Commission.

**experimental services** Access to hyperspectral instruments and/or data for experimental purposes, e.g. development of methods.

## F

**f-stop** Aperture stop, a number inversely proportional to the diameter of the entrance optics.

**FFRDC** Federally Funded Research and Development Center. Federally Funded Research and Development Centers are public-private partnerships which conduct research for the United States Government.

**field of view (FOV)** The solid angle through which an instrument is sensitive to radiation.

**FODIS** Fibre Optic Downwelling Irradiance Sensor

**FWHM** A full width at half maximum (FWHM) is an expression of the extent of a function, given by the difference between the two extreme values of the independent variable at which the dependent variable is equal to half of its maximum value. It is applied to the resolution of spectrometers.

## G

**gain** A general term used to denote an increase in signal power in transmission from one point to another. Gain is usually expressed in decibels.

**geolocation** The correspondence between position in an image and position in a geographic reference system.

**geometric correction** The process of determining the geolocation of an image pixel or other data.

**georeference-able** Data set for which information for the geolocation of each data element is available but not applied, so that the data set geometry is not compatible with a geographical representation such as a map.

**georeferenced** Data set for which the geolocation of each data element is known.

**georeferencing** see geometric correction.

**ground control point (GCP)** A geographic feature of known location that is recognizable on images to use them for rectification or other geometric corrections.

**ground sampling distance (GSD)** The distance from centroid to centroid between adjacent spatial samples on the earth's surface corresponding to respective detector pixels.

**ground track** The vertical projection of the actual flight path of an aerial or space vehicle onto the surface of the Earth.

**ground truth** Observations made on the ground at a site that is being imaged from space/air for the purpose of verifying either the absolute radiometric and/or geometric calibration of the imagery or the classified product from the image.

## H

**HDF** Hierarchical Data Format (HDF) is the name of a set of file formats and libraries designed to store and organize large amounts of numerical data.

**heading** Direction of aircraft's nose, in reference to the local magnetic north direction.

**hyperspectral** The simultaneous acquisition of images of the same area in many (usually 100 or more), narrow, contiguous, spectral bands.

**hyperspectral scanner** see imaging spectrometer.

## I

**IAGOS** In-service Aircraft for a Global Observing System. IAGOS is a new European Research Infrastructure conducting longterm observations of atmospheric composition, aerosol and cloud particles on a global scale from commercial aircraft of internationally operating airlines.

**IDL** The Interactive Data Language (IDL) is a data analysis language popular for science applications.

**image** A two dimensional grid of data. A more complete definitions is "an ordered set of data arranged in a way that when displayed represents the pattern of the measured variable through the earth surface".

**imaging spectrometer** An array sensor capable of imaging in as many as several hundred discrete spectral bands simultaneously. Also called a hyperspectral scanner.

**IMU** Inertial Measurement Unit. An IMU measures the rate and direction of motions and is used on sensor platforms to calculate its movement (roll, pitch, yaw). The IMU data is then used for georeferencing of remote sensing data.

**in situ** Latin for "in original place". Refers to measurements made at the actual location of the object or material measured.

**INS** Inertial navigation system. See IMU

**instantaneous field-of-view (iFOV)** The solid angle through which a detector or pixel is sensitive to radiation, commonly expressed in milliradians.

**instrument operator** Any institution offering access to hyperspectral instruments operated over an area of interest determined by a user or a data provider.

**IR** Infrared - Pertaining to or designating the portion of electromagnetic spectrum with wavelengths from the red end of the visible spectrum to the microwave portion of the spectrum, or from 0.7  $\mu\text{m}$  to 1mm.

**irect georeferencing** Use of IMU and GPS measurements, acquired parallel to the image data, to determine the external orientation of the sensor for georeferencing.

**irradiance** The measure of radiant flux incident on a surface in units of power or energy per unit time.

**ISARRA** International Society for Atmospheric Research using Remotely piloted Aircraft. ISARRA is being organized by a group of volunteer researchers as a non-fee member-based organization. Its aim is to provide a forum for the exchange of knowledge, experience, and ideas on the various aspects of atmospheric and related environmental research using remotely piloted aircraft.

## K

**keystone** Keystone is a change in optical magnification with wavelength for a fixed field position resulting in bending of this field point spectrum along the spectral axis. The spectral axis is defined by the lines of detector pixels in dispersion direction.

## L

**LAI** Leaf Area Index. Ratio of green leaf area per unit soil area.

**level 0 (processing level)** Data transcription from system file format to a standardized, readable and generic data format to be archived as raw data.

**level 1 (processing level)** Level 1 is instrument data, either in digital counts or in units of at-sensor radiance, appended with ancillary information like calibration coefficients and geolocation information per pixel. Sub-levels (L1a, L1b, L1c...) are open to specific definitions per provider.

**level 2 (processing level)** Geometric, radiometric and atmospheric corrected surface data. Reflectance, temperature and emissivity, although not directly measured, are considered level 2. Sub-levels (L2a, L2b, L2c...) are open to specific definitions per provider.

**level 2 atm (processing level)** Derived from the Level 1 product, the data converted to ground surface reflectance values after atmospheric correction.

**level 2 geo (processing level)** Derived from the Level 1 product and geometrically corrected (orthorectified) and re-sampled to a specified grid.

**level 3 (processing level)** Level 3 is any image that contains a geophysical variable not directly measured by the instrument, but are derived from its measurements (except for reflectance, temperature and emissivity, which are considered Level 2). Level 3 products contain thematic information extracted from hyperspectral data, ready to interpret.

**line scanner** A scanning radiometer which by use of a rotating or oscillating plane mirror can scan a path normal to the movement of the radiometer. The mirror directs incoming radiation to a detector, which converts it into an electric signal.

**line spread function (LSF)** A measure of the geometrical performance of an optical system which defines the apparent shape of a target as it appears in the output image. A plot of illuminance of the image as a function of distance in the image plane.

**LUT** A Look-Up Table (LUT) is a data structure often used to replace a runtime computation with a simpler array indexing operation.

## M

**map projection** Any systematic arrangement of meridians and parallels portraying the curved surface of a sphere or spheroid upon a plane.

**metadata** Information describing data sets and making it possible to discover, inventory and use them (INSPIRE directive, CF conventions). Data about data (ISO 19115).

**minimum noise fraction (MNF)** Linear transform to estimate the actual dimension of an image and to remove noise and reduce processing time.

**MIVIS** Multispectral Infrared and Visible Imaging Spectrometer.

**MODIS** Moderate Resolution Imaging Spectroradiometer.

**modulation transfer function (MTF)** The geometric description of a detector's instantaneous field-of-view (IFOV) from the airborne sensor.

**mosaic** An image or photograph made by piecing together individual images or photographs covering adjacent areas.

**multispectral** Generally denotes remote sensing data in more than one spectral band.

**MWIR** Midwave infrared - 3-6  $\mu\text{m}$ , the detected energy is a mixture of solar reflected and thermally emitted radiation.

## N

**nadir** That point on a sphere vertically below the observer. The opposite of the zenith.

**NASA** National Aeronautics and Space Administration. The National Aeronautics and Space Administration is the United States government agency responsible for the civilian space program as well as aeronautics and aerospace research.

**NCAR** National Center for Atmospheric Research. The National Center for Atmospheric Research is a US federally funded research and development center (FFRDC) managed by the nonprofit University Corporation for Atmospheric Research (UCAR) and funded by the National Science Foundation (NSF)

**NDVI** Normalized Difference Vegetation Index. NDVI is the most commonly used vegetation index for satellite imagery. The typical range of actual values is about 0.1 for bare soils to 0.9 for dense vegetation.

**NetCDF** NetCDF (Network Common Data Form) is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.

**NIR** Near infrared - The preferred term for the shorter wavelengths in the infrared region.

**noise** Any unwanted disturbance affecting a measurement (as of a frequency band), especially that which degrades the information-bearing quality of the data of interest. Noise includes systematic or random sources.

**noise equivalent delta temperature (NE $\Delta$ T)** The change in temperature that yields a signal-to-noise ratio of unity (thermal sensors).

**noise equivalent radiance (NER)** Uncertainty in sensor measurements in terms of radiance units.

**NSF** National Science Foundation. The National Science Foundation is a United States government agency that supports fundamental research and education in all the non-medical fields of science and engineering.

## O

**on-board calibration** Internal spectral and radiometric calibration of the sensor during the data acquisition.

**operational services** Access to hyperspectral instruments and/or data for operational purposes, e.g. monitoring applications for governments.

**orthoimage** An image which is obtained by a vertical projection (i.e. with no parallax).

**orthorectification** Process of changing the arrangement of data elements in an image towards an orthometric projection (i.e. a true vertical projection)

## P

**particle number concentration** The number of particles present in a given volume of air.

**particle size distribution** The relative, size sorted number of particles present in a given volume of air.

**photo response non uniformity** Variation in sensitivity of pixels of a detector concerning a stable, homogeneous light source.

**pitch** The rotation of an aircraft or spacecraft about the horizontal axis normal to its longitudinal axis (in the along-track direction) so as to cause a nose-up or nose-down attitude.

**pixel** Picture element. A single element of a digital image data set.

**point spread function (PSF)** The inferring of spatial characteristics of the instrument from the collected image of a point source such as a star.

**polarization** The polarization describes the orientation of oscillations of waves and is an attribute of light.

**pre-processing** Commonly used to describe the correction and processing of sensor data prior to information extraction.

**protocol** A predefined procedural method in the design and implementation of experiments.

**pushbroom** A method of taking remote sensing data by composing an image of information taken by line scanners.

## Q

**quality** The characteristics of a product or service that bear on its ability to satisfy stated or implied needs. Degree to which a set of inherent characteristic fulfils requirements (ISO9000)

**quality assurance (QA)** QA refers to a program for the systematic monitoring and evaluation of the various aspects of a project, service, or facility to ensure that standards of quality are being met.

**quality indicator (QI)** A means of providing a user of data or derived product (which is the result of a process) with sufficient information to assess its suitability for a particular application. This information should be based on a quantitative assessment of its traceability to an agreed reference or measurement standard (ideally SI), but can be presented as numeric or a text descriptor, providing the quantitative linkage is defined (CEOS)

**quality layer (QL)** Quality indicator presented as a spatial dataset

**quicklook** A quicklook is a downgraded image of the data, displayed as a jpg or similar, to allow a quick check of the data.

## R

**radiance** Measure of the energy radiated by an object. In general, radiance is a function of viewing angle and spectral wavelength and is expressed as energy per solid angle.

**radiation** The process by which electromagnetic energy is propagated through any medium by virtue of wave motion variations in electric and magnetic fields.

**radiometric calibration** Radiometric calibration consists in linking pixels intensities to a physical parameter.

**radiometric resolution** The smallest difference in radiance that can be detected. Describes how precisely radiance is depicted in a set of data, as a result of both the sensor and subsequent data transformations such as analogue-to-digital conversion.

**radiometric response** Radiometric response (the same as gain/slope/calibration coefficient) is a ratio between the input and output signals.

**radiometric stability** Change of end-to-end instrument response between calibration cycles at a constant at-sensor radiance level.

**raster** Refers to the two-dimensional array of pixels in an image.

**real-time** The actual time during which something takes place [acc. to Meriam-Webster]. Characteristic in case of data transfers is a negligible time-delay between the data gathering and transmission.

**rectification** Process by which a tilted or oblique image is projected onto a horizontal reference plane, the angular relation between the image and the plane being determined by ground reconnaissance.

**red edge** Spectral region at the limit of the red and near-infrared wavelengths characterized by a sharp rise in the plant reflectance.

**reflectance** The ratio of amount of electromagnetic energy reflected by a surface to amount of energy incident on the surface.

**remote sensing** The measurement or acquisition of information of some property of an object or phenomenon, by a recording device that is not in physical or intimate contact with the object or phenomenon under study.

**resampling** Rearrangement of the resolution of cells of each scanned line of an image into geometrically equal terrain elements.

**research infrastructure** Refers to facilities, resources and related services used by the scientific community for leading edge research.

**resolution** A measure of the ability to separate observable quantities.

**roll** The rotation of an aircraft or spacecraft about its longitudinal axis (in the along-track direction) so as to cause a side-up or side-down attitude.

## S

**saturation** The point at which a system is unable to handle any further input. That is, when the input signal (e.g. the voltage) exceeds the dynamic range of the detector.

**scale** The ratio of a distance on an image or map to its corresponding distance on the ground.

**scan line** The ground trace of a narrow strip that is recorded by the instantaneous field of view of a detector in a scanner system.

**scene** Terrain area covered by an image; several images (in different spectral bands, or different time repetitions) correspond to a single scene.

**sensor** Any device that gathers energy and presents it in a form suitable for obtaining information about the environment.

**signal-to-noise ratio (SNR)** The ratio of level of signal power to the level of noise power disturbing the signal.

**signature** see spectral signature

**smile** Smile is the change of dispersion angle with the field position. It results in the bending of the spectral lines (in the hyper spectral image).

**solar azimuth** Azimuth angle of the sun. Angle between the line from the observer to the sun projected on the ground and the line from the observer due north in a clockwise direction. (North =  $0^\circ$ , East =  $90^\circ$ )

**solar elevation** Elevation angle of the sun. Angle between the direction of the geometric centre of the sun's apparent disk and the horizon. (sunrise =  $0^\circ$ )

**solar zenith** Zenith angle of the sun. Angle between the direction of the geometric centre of the sun's apparent disk and the zenith. (sunrise =  $90^\circ$ )

**spatial data** Any data with a direct or indirect reference to a specific location or geographical area.

**spatial resolution** A measure of the ability to separate or distinguish closely spaced spatial objects.

**spectral band** Wavelength region of one spectral interval within the spectral coverage of an instrument. Often called spectral channel.

**spectral calibration** Laboratory measurements of spectral sensor properties. The measurements are used to calculate the spectral sensor parameters.

**spectral channel** see spectral band

**spectral coverage** Wavelength range between the lower wavelength boundary and the upper wavelength boundary measured by an instrument.

**spectral resolution** A measure of the ability to resolve features of the electromagnetic spectrum.

**spectral response** The response of a material as a function of wavelength to incident electromagnetic energy, particularly in terms of the measurable energy reflected from and emitted by the material.

**spectral sampling distance** Distance in wavelength between the spectral band centre wavelengths of neighbouring spectral bands.

**spectral signature** The quantitative measurement of the properties of an object at one or several wavelength intervals. That is, the spectral distribution pattern of radiation reflected and/or emitted by an object.

**spectrometer** A device used to measure radiant intensity or to determine the wavelengths of various radiations.

**standard** A published document which sets out specifications and procedures designed to ensure that a material, product, method or service is fit for its purpose and consistently performs in the way it was intended.

**standard deviation (STD)** The square root of the variance. The value is expressed in the units of measure in which the observations were taken.

**stray light** Radiation that reaches the detector from outside its iFOV or from within the sensor by reflection or diffusion.

**striping** Banding effect caused by the variation of the spectral response of the detectors of a sensor.

**sun angle** The angle of the Sun above the horizon. Also called Sun elevation and Sun elevation angle.

**sunphotometer** A device that measures the properties of light emanating from the sun.

**survey** Data acquisition over area of interest determined by a user or a data provider.

**swath** Across track extent of a strip or segment of an airborne or satellite sensor.

**SWIR** Shortwave infrared - The preferred term for the longer wavelengths in the infrared region.

**system correction** System correction denotes the calibration of the data from raw DN to a physical unit (usually at-sensor radiance) using calibration coefficients derived from laboratory calibration and/or based on on-board calibration sources.

## T

**temporal coverage** Regular data acquisition during a longer period of time (e.g., a survey each year during 10 or more years).

**time stamp** The exact time a data sample was taken – usually obtained from a GPS or IRIG-B feed in aircraft measurements

**timeseries** A sequence of data points measured at successive points in time.

**TIR** Thermal infrared - the preferred term for the middle wavelength ranges of the infrared region extending roughly from 3  $\mu\text{m}$  at the end of the near infrared, to about 15 or 20  $\mu\text{m}$  where the far infrared commences.

**transmittance** The ratio of the energy per unit time per unit area (radiant power density) transmitted through an object to the energy per unit time per unit area incident on the object.

## U

**UCAR** University Corporation for Atmospheric Research. The University Corporation for Atmospheric Research is a nonprofit consortium of more than 75 universities offering Ph.D.s in the atmospheric and related sciences. UCAR manages the National Center for Atmospheric Research (NCAR) and provides additional services to strengthen and support research and education through its community programs.

**UV** Ultraviolet - shorter wavelength than visible but longer than X-rays.

## V

**validation (Val)** The process of assessing, by independent means, the quality of the data products derived from the system outputs in comparison with values from sampling at the earth's surface of the same target or with modelled surrogates.

**value-adder** Anyone altering data in order to facilitate thematic information extraction.

**verification** Confirmation, through provision of objective evidence that the requirements have been fulfilled.

**vicarious calibration** Radiometric calibration of a sensor by a method independent of that used to perform the initial laboratory calibration.

**VIS** Visible - wavelength interval to which the human eye is sensitive.

## **W**

**wavelength** In general, the mean distance between maxima (or minima) of a roughly periodic pattern. Specifically, the shortest distance between particles moving in the same phase of oscillation in a wave disturbance.  
Wavelength = 1/frequency

**whiskbroom** A method of taking remote sensing data by composing an image of information taken by line scanners.

## **X**

**XML** eXtensible Markup Language (XML) is a set of rules for encoding documents electronically.

## **Y**

**yaw** The rotation of an aircraft or spacecraft about its vertical axis so as to cause the craft's longitudinal axis to deviate left or right from the direction of flight.

## **Z**

**zenith** The point in a sphere that is exactly overhead and the opposite of nadir.