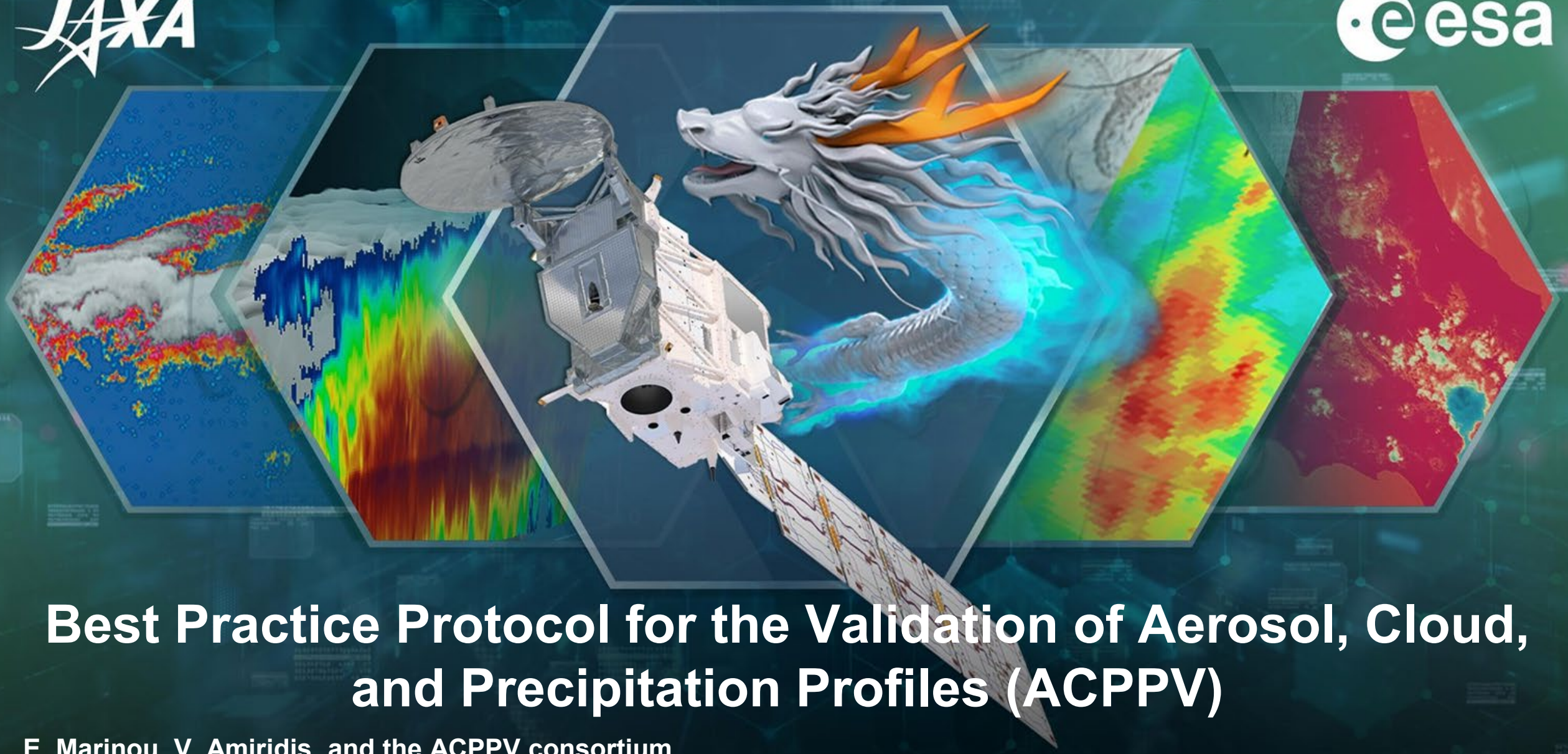
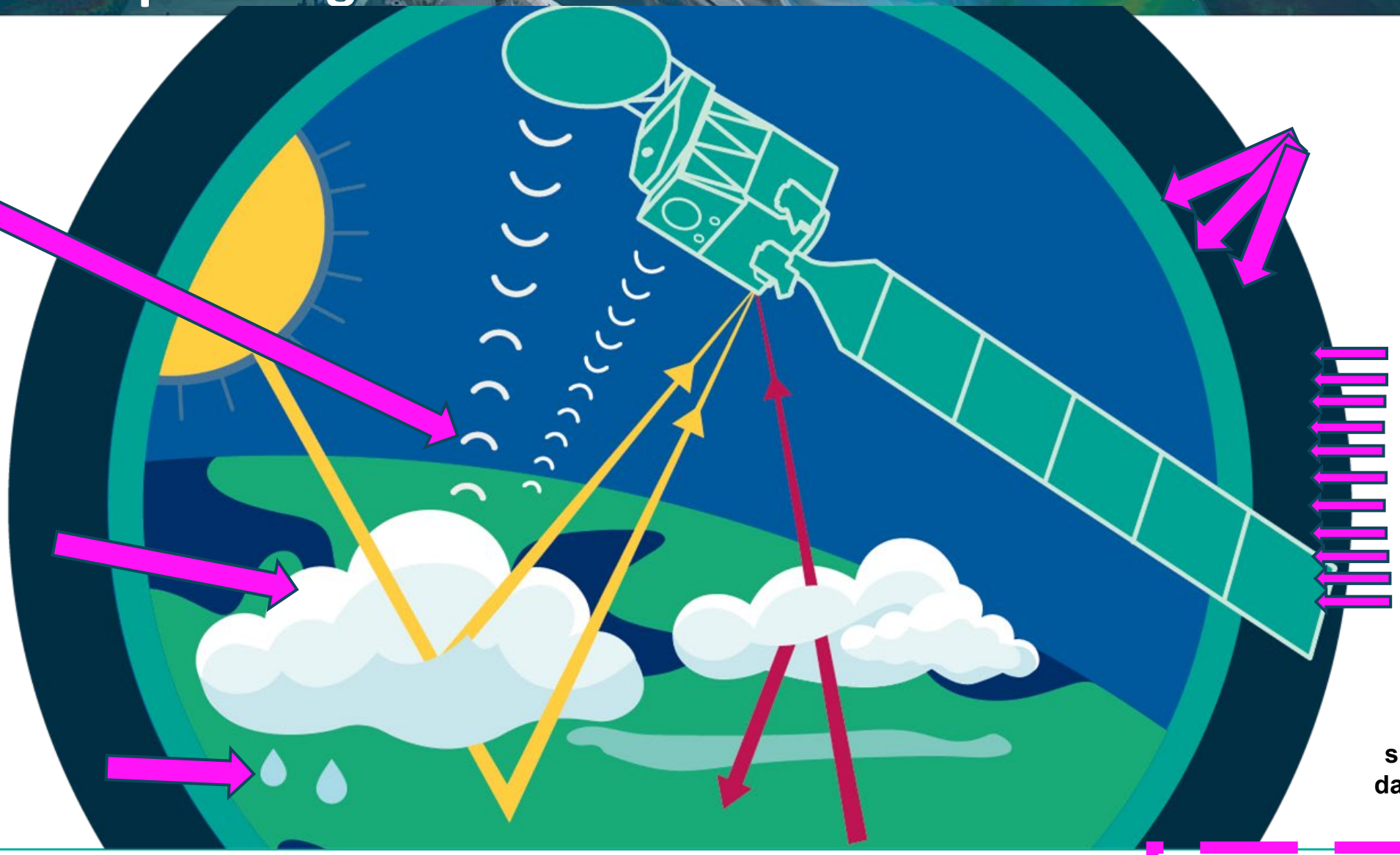


Best Practice Protocol for the Validation of Aerosol, Cloud, and Precipitation Profiles (ACPPV)

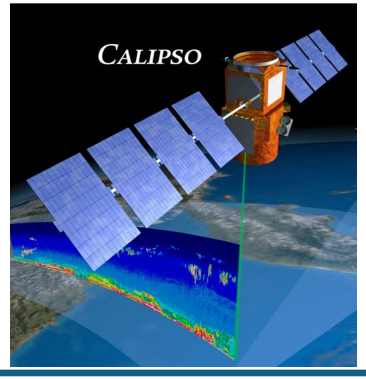
E. Marinou, V. Amiridis, and the ACPPV consortium

2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop
17 – 20 March 2025 | ESA-ESRIN

Validation challenges unique to aerosol, cloud, precipitations profiling

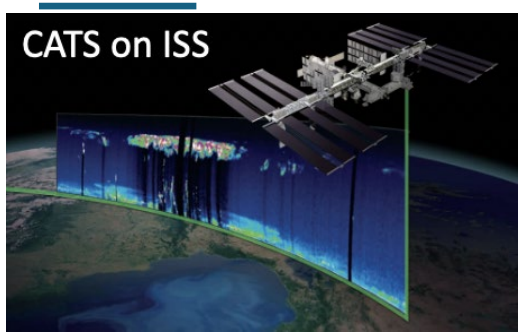


Continuity of profiling missions



LUCE, AOS
Aeolus 2
(candidate mission: WIVERN)

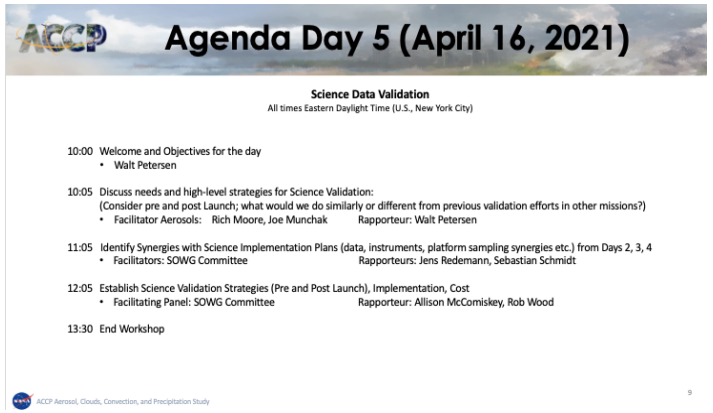
2006 2008 2010 2012 2014 2016 2018 2020 2022 2024 2026 2028 2030 2032 2034



*The satellite images were taken from ESA, NASA and JAXA websites (esa.int; earth.esa.int; www.nasa.gov; cats.gsfc.nasa.gov; global.jaxa.jp)

EarthCARE and AOS scientists' recommendations

AOS & 2nd Sub-orbital EarthCARE Workshop, **2021**



1. **Need for convergence on common Cal/Val practices acknowledging:**
   - Lessons learned
   - Methods and approaches
   - In-orbit & pre-launch validation
   - Airborne campaigns & networks

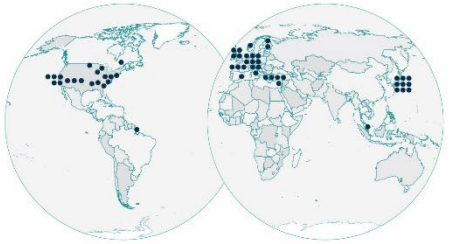
2. **Consolidation of best practices in a CEOS level document**
   - No CEOS document for profilers

CEOS
Committee on Earth Observation Satellites

Consortium of 97 scientist

Amiridis, V., Marinou, E., Hostetler, C., Koopman, R., Cecil, D. J., Moisseev, D., Tackett, J., Gross, S., Baars, H., Redemann, J., Marenco, F., Baldini, L., Tanelli, S., Fielding, M., Janisková, M., Tanaka, T., O'Connor, E., Fjæraa, A. M.
Paschou, P., Voudouri, K. A., Ferrare, R., Burton, S., Schuster, G., Kato, S., Winker, D., Shook, M., Bley, S., Haarig, M., Floutsi, A. A., Wandinger, U., Trapon, D., Pfitzenmaier, L., Papagianopoulos, N., Mona, L., Posselt, D., Mason, S., Rennie, M., Benedetti, A., Hogan, R., Sogacheva, L., Balis, D., Michailidis, K., van Zadelhoff, G. J., Nowottnick, E., Yorks, J., Mroz, K., Donovan, D., L'Ecuyer, T., Okamoto, H., Sato, K., Henderson, D. S., Nishizawa, T., Barker, H., Cole, J., Qu, Z., Clerbaux, N., Nakajima, T. Y., Chase, R., Wolff, D., Landulfo, E., Kirstetter, P. E., Mather, J., Ohigashi, T., Ryder, C., Tzallas, V., Tsikoudi, I., Tsekeri, A., Tsichla, M.1, Koutsoupi, I., Kubota, T., Siomos, N., Takahashi, N., Horie, H., Suzuki, K., Mace, J., Prakash, G., McLean, W., Borderies, M., Mangla, R., Escribano, J., Moradi, I., Zhang, J., Rubin, J., Ikuta, Y., Marbach, T., Bojkov, B., Accadia, C., Fougnie, B., Spezzi, L., Bozzo, A., Chimot, J., Jafariserajehlou, J., Flament, T., Mattioli, V., Strandgren, J., Barlakas, V., and Kollias, P.

BEST PRACTICE PROTOCOL FOR THE VALIDATION OF AEROSOL, CLOUD, AND PRECIPITATION PROFILES (ACPPV) CONSORTIUM



57 space agencies, institutes, universities

ACPPV protocol

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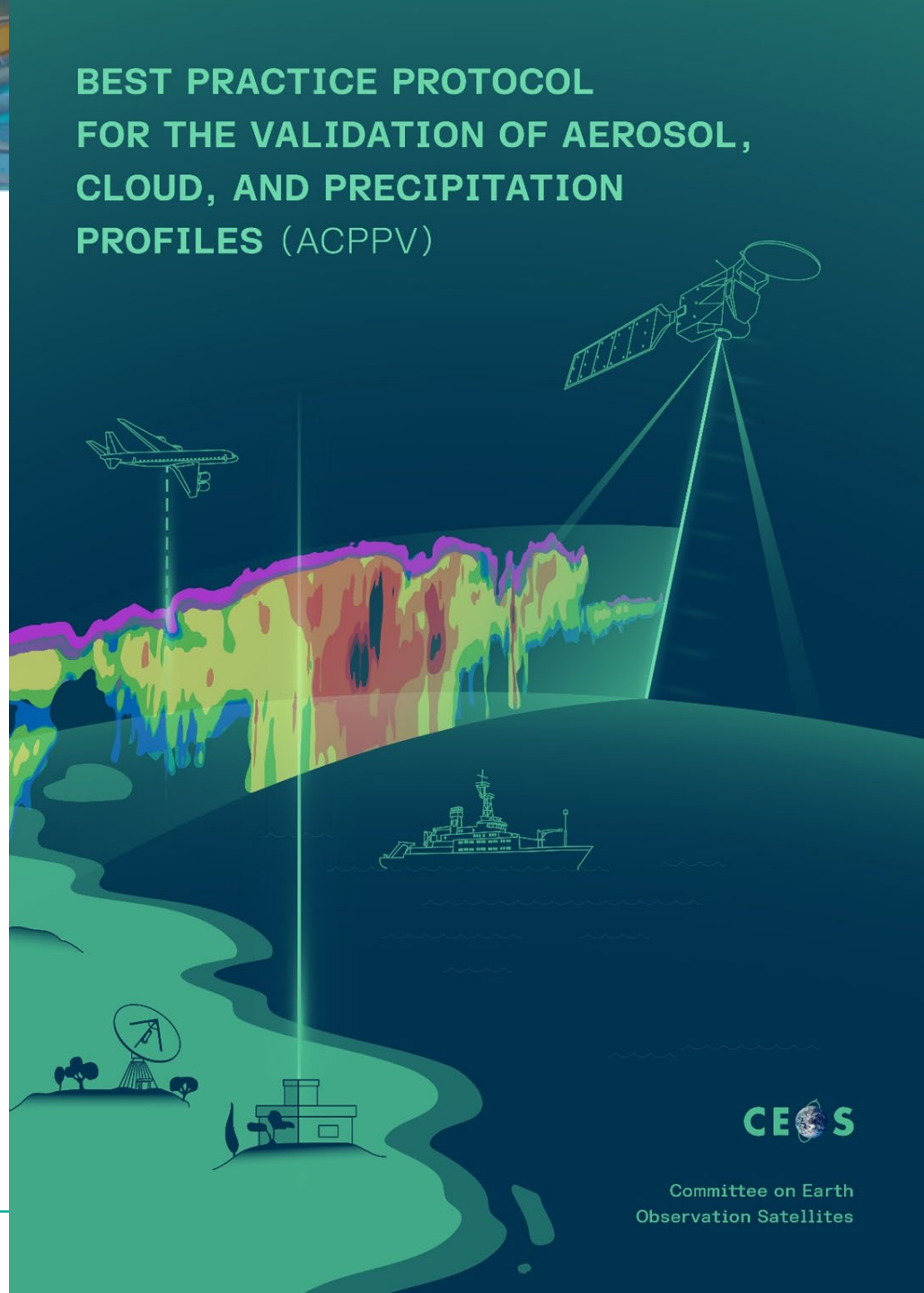

ACPPV chapters & leads

Chapter 1: Introduction [V. Amiridis, D. Cecil, R. Koopman]

- Overview of past, present, and future space missions
- Validation objectives for space profilers
- Cal/Val definitions/nomenclature and validation metrics

Chapter 2: Validation needs for Space Profilers [L. Baldini, T. l'Ecuyer, H. Okamoto]

- Detailed list of products from space profilers (CALIOP, CATS, CloudSat, GPM, EarthCARE Atlid & CPR, INCUS)
- Validation needs from the product developer's perspective

Chapter 3: Survey of validation measurements [S. Gross, J. Redemann, F. Marenco]

- Types of validation instruments & specific instruments
- Spatiotemporal representativeness, scene homogeneity and co-location criteria for correlative measurements
- Quality of measurements

Chapter 4: Correlative metadata and data format [E. O'Connor, A. M. Fjæraa]

- Guidelines on a proper definition of metadata and data formats for Cal/Val archives

ACPPV chapters & lead authors

Chapter 5: Guidance for the validation of lidar and aerosol products [E. Marinou]

- Guidelines for validation of different lidar and aerosol products with ref. on past studies

Chapter 6: Guidance for validation of radar, cloud, and precipitation products [D. Moisseev, S. Tannelli]

- Guidelines for validation of different radar, cloud, and precipitation products with ref. on past studies

Chapter 7: Statistical validation [J. Tackett]

- Near-instantaneous comparisons
- Climatological comparisons

Chapter 8: Near-real time validation through data assimilation [M. Fielding, M. Janisková]

- Key considerations and data quality principles
- Demonstrations of data quality monitoring

Chapter 9: Gaps and Challenges [H. Baars]

- General knowledge gaps, data coverage gaps, missing reference instruments, validation approaches
- Recommendations per gap/challenge

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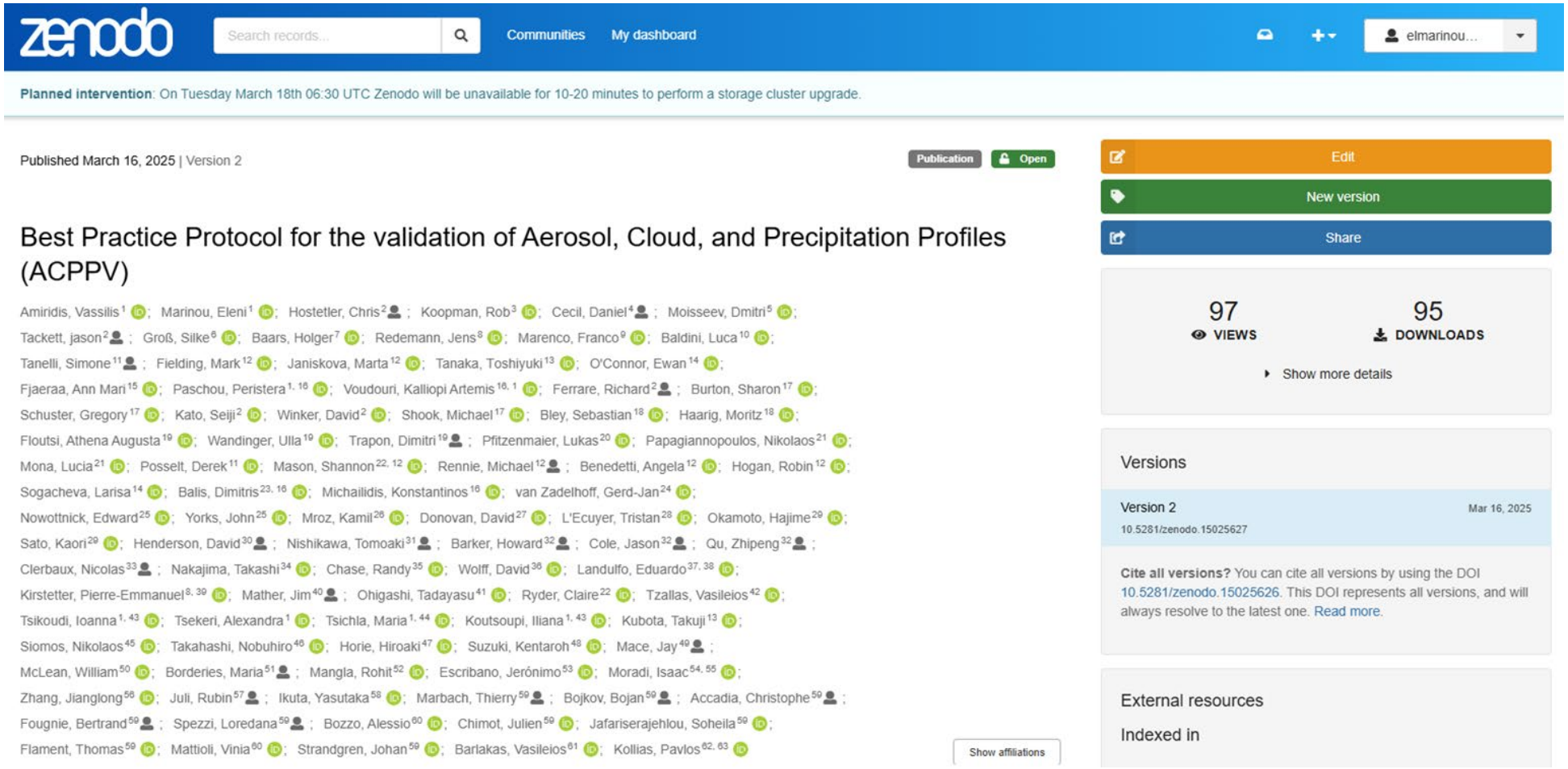

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Best Practice Protocol for the validation of Aerosol, Cloud, and Precipitation Profiles (ACPPV)

Amiridis, Vassilis[1]; Marinou, Eleni[1]; Hostetler, Chris[2]; Koopman, Rob[3]; Cecil, Daniel[4]; Moisseev, Dmitri[5]; Tackett, jason[2]; Groß, Silke[6]; Baars, Holger[7]; Redemann, Jens[8]; Marenco, Franco[9]; Baldini, Luca[10]; Tanelli, Simone[11]; Fielding, Mark[12]; Janiskova, Marta[12]; Tanaka, Toshiyuki[13]; O'Connor, Ewan[14]; Fjaeraa, Ann Mari[15]; Paschou, Peristera[1, 16]; Voudouri, Kalliopi Artemis[16, 1]; Ferrare, Richard[2]; Burton, Sharon[17]; Schuster, Gregory[17]; Kato, Seiji[2]; Winker, David[2]; Shook, Michael[17]; Bley, Sebastian[18]; Haarig, Moritz[18]; Floutsi, Athena Augusta[19]; Wandinger, Ulla[19]; Trapon, Dimitri[19]; Pfitzenmaier, Lukas[20]; Papagiannopoulos, Nikolaos[21]; Mona, Lucia[21]; Posselt, Derek[11]; Mason, Shannon[22, 12]; Rennie, Michael[12]; Benedetti, Angela[12]; Hogan, Robin[12]; Sogacheva, Larisa[14]; Balis, Dimitris[23, 16]; Michailidis, Konstantinos[16]; van Zadelhoff, Gerd-Jan[24]; Nowottnick, Edward[25]; Yorks, John[25]; Mroz, Kamil[26]; Donovan, David[27]; L'Ecuyer, Tristan[28]; Okamoto, Hajime[29]; Sato, Kaori[29]; Henderson, David[30]; Nishikawa, Tomoaki[31]; Barker, Howard[32]; Cole, Jason[32]; Qu, Zhipeng[32]; Clerbaux, Nicolas[33]; Nakajima, Takashi[34]; Chase, Randy[35]; Wolff, David[36]; Landulfo, Eduardo[37, 38]; Kirstetter, Pierre-Emmanuel[8, 39]; Mather, Jim[40]; Ohigashi, Tadayasu[41]; Ryder, Claire[22]; Tzallas, Vasileios[42]; Tsikoudi, Ioanna[1, 43]; Tsekeri, Alexandra[1]; Tsichla, Maria[1, 44]; Koutsoupi, Iliana[1, 43]; Kubota, Takuji[13]; Siomos, Nikolaos[45]; Takahashi, Nobuhiro[46]; Horie, Hiroaki[47]; Suzuki, Kentaroh[48]; Mace, Jay[49]; McLean, William[50]; Borderies, Maria[51]; Mangla, Rohit[52]; Escribano, Jerónimo[53]; Moradi, Isaac[54, 55]; Zhang, Jianglong[56]; Juli, Rubin[57]; Ikuta, Yasutaka[58]; Marbach, Thierry[59]; Bojkov, Bojan[59]; Accadia, Christophe[59]; Fougnie, Bertrand[59]; Spezzi, Loredana[59]; Bozzo, Alessio[60]; Chimot, Julien[59]; Jafariserajehlou, Soheila[59]; Flament, Thomas[59]; Mattioli, Vinia[60]; Strandgren, Johan[59]; Barlakas, Vasileios[61]; Kollias, Pavlos[62, 63]

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