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Preface

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The *Project for On-Board Autonomy* 2 (PROBA2) mission has been in orbit 3.5 years and has evolved from a successful technology demonstration platform to a solar-science observatory and will soon become a space-weather monitoring mission. Few satellites have been so versatile in use; this is all the more remarkable knowing that PROBA2 is only a cubic-meter in size, low-budget micro-satellite.

Nobody could have guaranteed its broad popularity during the Summer of 2002, when researchers at the Royal Observatory of Belgium replied enthusiastically to ESA's call for instruments onboard the second satellite in the PROBA program. In that year, solar maximum was in full swing and ESA was preparing for a European wide "Space Weather Applications Pilot Project". At the Centre Spatial de Liège and the Royal Observatory of Belgium, people were working on the design of a suite of large EUV imagers called *Magritte* with an innovative off-axis telescope layout. Also innovative sensors and new non-silicon detectors were being studied in technological projects such as the *Blind to the Optical Light Detector* (BOLD) program.

PROBA2 – First Two Years of Solar Observation
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That combination of ingredients and a few short nights and litres of coffee resulted in two instrument proposals submitted only hours before the deadline. A first proposal, called the *Sun Watcher using APS and image Processing* (SWAP) was proposing a (miniaturized) version of the *Magritte* off-axis telescope, equipped with a CMOS-APS detector. *Magritte* was never built, but SWAP made its way into history! A second proposal, the *Large-Yield Radiometer* (LYRA), was offering to adapt the *Picard*/PREMOS instrument design, developed in parallel by the Physikalisch-Meteorologisches Observatorium Davos/World Radiation Centre (PMOD-WRC, Switzerland), to demonstrate the benefits of diamond detectors for solar space observations. Frederic Teston, the ESA PROBA program manager, said much later that it was precisely the combination of the two solar instruments, each with their new technology, that made it a winning team. Whereas PROBA1 contained Earth observation instruments, PROBA2 would thus focus on solar observations.

The PROBA2 instrument call foresaw an instrument development cycle of two years and a launch in 2005. But the machinery of history works at its own pace, resulting – finally – in a launch at the end of 2009. In the years in between, the SWAP and LYRA instrument teams learned the wonders of the PROBA micro-sat approach, with its intrinsic limits and opportunities. No one is watching after the spacecraft in the weekend, as it is autonomous enough. But if really desired, the instrument teams can off-point the spacecraft *à volonté* directly from their laptop. No other solar observing satellite provides this service to its users!

The vision that micro-satellites, such as PROBA2, have an important role to play was long promoted by former ESA Director Michel Courtois. PROBA-V (V for Vegetation) is currently being prepared for launch. PROBA3, a pair of formation-flying satellites together forming a giant coronagraph is being designed. Also in the ESA Science Directorate, one has recognized the value of micro-satellites, as demonstrated by the selection of the CHEOPS micro-satellite for studying exoplanets.

This Topical Issue of *Solar Physics* contains a collection of articles describing in detail the PROBA2 mission, the SWAP and LYRA instruments, and their data products, so that any external researcher can join in the exploitation of the PROBA2 open data archive. Example research articles addressing a variety of science topics are also included. We hope that they serve to encourage you to participate in this exciting adventure!

Bazin, C., Koutchmy, S., Tavabi, E.: 2013, Prominence Cavity Regions Observed Using SWAP 174 Å Filtergrams and Simultaneous Eclipse Flash Spectra. *Solar Phys.* **286**(1), 255 – 270. doi:10.1007/s11207-012-0188-1.

Berghmans, D., De Groof, A., Dominique, M., Hochedez, J.-F., Leibacher, J.W.: 2013, PROBA2 Topical Issue Preface. *Solar Phys.* **286**(1), 1 – 3. doi:10.1007/s11207-013-0300-1.

Bonte, K., Berghmans, D., De Groof, A., Steed, K., Poedts, S.: 2013, SoFAST: Automated Flare Detection with the PROBA2/SWAP EUV Imager. *Solar Phys.* **286**(1), 185 – 199. doi:10.1007/s11207-012-0165-8.

Chandrashekhar, K., Prasad, S.K., Banerjee, D., Ravindra, B., Seaton, D.B.: 2013, Dynamics of Coronal Bright Points as Seen by *Sun Watcher Using Active Pixel System Detector and Image Processing* (SWAP), *Atmospheric Imaging Assembly* (AIA), and *Helioseismic and Magnetic Imager* (HMI). *Solar Phys.* **286**(1), 125 – 142. doi:10.1007/s11207-012-0046-1.

Dominique, M., Hochedez, J.-F., Schmutz, W., Dammasch, I.E., Shapiro, A.I., Kretzschmar, M., Zhukov, A.N., Gillotay, D., Stockman, Y., BenMoussa, A.: 2013, The LYRA Instrument Onboard PROBA2: Description and In-Flight Performance. *Solar Phys.* **286**(1), 21 – 42. doi:10.1007/s11207-013-0252-5.

Filippov, B., Koutchmy, S., Tavabi, E.: 2013, Formation of a White-Light Jet Within a Quadrupolar Magnetic Configuration. *Solar Phys.* **286**(1), 143 – 156. doi:10.1007/s11207-011-9911-6.

Halain, J.-P., Berghmans, D., Seaton, D.B., Nicula, B., De Groof, A., Mierla, M., Mazzoli, A., Defise, J.-M., Rochus, P.: 2013, The SWAP EUV Imaging Telescope. Part II: In-flight Performance and Calibration. *Solar Phys.* **286**(1), 67 – 91. doi:10.1007/s11207-012-0183-6.

Kienreich, I.W., Muhr, N., Veronig, A.M., Berghmans, D., De Groof, A., Temmer, M., Vršnak, B., Seaton, D.B.: 2013, *Solar TErrestial Relations Observatory-A* (STEREO-A) and *PRoject for On-Board Autonomy 2* (PROBA2) Quadrature Observations of Reflections of Three EUV Waves from a Coronal Hole. *Solar Phys.* **286**(1), 201 – 219. doi:10.1007/s11207-012-0023-8.

Kretzschmar, M., Dominique, M., Dammasch, I.E.: 2013, Sun-as-a-Star Observation of Flares in Lyman α by the PROBA2/LYRA Radiometer. *Solar Phys.* **286**(1), 221 – 239. doi:10.1007/s11207-012-0175-6.

Mierla, M., Seaton, D.B., Berghmans, D., Chifu, I., De Groof, A., Inhester, B., Rodriguez, L., Stenborg, G., Zhukov, A.N.: 2013, Study of a Prominence Eruption using PROBA2/SWAP and STEREO/EUVI Data. *Solar Phys.* **286**(1), 241 – 253. doi:10.1007/s11207-012-9965-0.

Raftery, C.L., Bloomfield, D.S., Gallagher, P.T., Seaton, D.B., Berghmans, D., De Groof, A.: 2013, Temperature Response of the 171 Å Passband of the SWAP Imager on PROBA2, with a Comparison to TRACE, SOHO, STEREO, and SDO. *Solar Phys.* **286**(1), 111 – 124. doi:10.1007/s11207-013-0266-z.

Santandrea, S., Gantois, K., Strauch, K., Teston, F., PROBA2 Project Team, Tilmans, E., Baijot, C., Gerrits, D., PROBA2 Industry Team, De Groof, A., Schwehm, G., Zender, J.: 2013, PROBA2: Mission and Spacecraft Overview. *Solar Phys.* **286**(1), 5 – 19. doi:10.1007/s11207-013-0289-5.

Seaton, D.B., Berghmans, D., Nicula, B., Halain, J.-P., De Groof, A., Thibert, T., Bloomfield, D.S., Raftery, C.L., Gallagher, P.T., Auchère, F., Defise, J.-M., D'Huys, E., Lecat, J.-H., Mazy, E., Rochus, P., Rossi, L., Schühle, U., Slemzin, V., Yalim, M.S., Zender, J.: 2013, The SWAP EUV Imaging Telescope Part I: Instrument Overview and Pre-Flight Testing. *Solar Phys.* **286**(1), 43 – 65. doi:10.1007/s11207-012-0114-6.

Shapiro, A.I., Schmutz, W., Dominique, M., Shapiro, A.V.: 2013, Eclipses Observed by *Large Yield RAdiometer* (LYRA) – A Sensitive Tool to Test Models for the Solar Irradiance. *Solar Phys.* **286**(1), 271 – 287. doi:10.1007/s11207-012-0063-0.

Shapiro, A.V., Shapiro, A.I., Dominique, M., Dammasch, I.E., Wehrli, C., Rozanov, E., Schmutz, W.: 2013, Detection of Solar Rotational Variability in the *Large Yield RAdiometer* (LYRA) 190 – 222 nm Spectral Band. *Solar Phys.* **286**(1), 289 – 301. doi:10.1007/s11207-012-0029-2.

Slemzin, V., Harra, L., Urnov, A., Kuzin, S., Goryaev, F., Berghmans, D.: 2013, Signatures of Slow Solar Wind Streams from Active Regions in the Inner Corona. *Solar Phys.* **286**(1), 157 – 184. doi:10.1007/s11207-012-0004-y.

Zender, J., Berghmans, D., Bloomfield, D.S., Cabanas, C., Dammasch, I., De Groof, A., D'Huys, E., Dominique, M., Gallagher, P., Giordanengo, B., Higgins, P.A., Hochedez, J.-F., Yalim, M.S., Nicula, B., Pylyser, E., Sanchez-Duarte, L., Schwehm, G., Seaton, D.B., Stanger, A., Stegen, K., Willems, S.: 2013, The *Projects for Onboard Autonomy* (PROBA2) Science Centre: *Sun Watcher Using APS Detectors and Image* (SWAP) and *Large-Yield Radiometer* (LYRA) Science Operations and Data Products. *Solar Phys.* **286**(1), 93 – 110. doi:10.1007/s11207-012-0033-6.