PROBA2 Guest Investigator Program

Overview of proposals

16 proposals received

- Austria: 1 (p5)
- Belgium: 1 (p9)
- China: 1 (p13)
- France: 5 (p1,3,8,9,15)
- Germany: 2 (p6, p16)
- Greece: 1 (p11)
- India: 3 (p1,4,12)
- Iran: 1 (p8)
- Russia: 4 (p2,3,7,9)
- UK: 1 (p2)
- US: 1 (p10,12,14)

Involved PROBA2 instrument

SWAP	LYRA	SWAP & LYRA
2,3,4,5,7,8,9,11,12 (9 proposals)	1,10 (2 proposals)	6,13,14,15, 16 (5 proposals)

Science topics:

- CMEs: p9, p11, p12, p13, p14
- Jets: p3, p4, p8
- EUV solar spectrum & variability: p1, p15
- EIT waves: p5, p6
- Solar flares: p6, p14
- Coronal holes & solar wind: p7
- Prominences/filaments: p12
- Structure of inner solar corona: p2, p13

Other topics:

- (E)UV impact on ionosphere: p16
- Instrumental cross-calibration: p10, p15
- Education & Public Outreach: p16
- Integrated platform SW: p13

1. Understand the Solar UV & Lyman Alpha Irradiance Variability From LYRA Observations

R. Kariyappa, Bangalore, India
Luc Damé, LATMOS/CNRS, France

Instruments: **LYRA** + SOHO/MDI + SOHO/EIT

Aims:
- understand the origin and nature of the changes in solar UV (304A) & Lyman-alpha irradiance in association to surface manifestations of solar magnetic activity,
- determine the contribution of different features of the chromosphere

Means:
- study Ly-alpha & UV variability by comparing EIT304 images with LYRA Ly-alpha & HeII data
- determine role of magnetic fields in EUV variability by comparison with MDI magnetograms
- Segregation of chromospheric features to make feature-to-feature correlations

Specific Observations: ??

Why PROBA2? LYRA EUV channels & high cadence LYRA

Time frame:

Costs: Travel 1200€

2. Study of the solar inner corona and search for the quasi-stationary coronal streams from active regions using SWAP off-disk observations

Vladimir Slemzin, LPI, Moscow, Russia
Sergey Kuzin, Alexander Urnov, LPI
Louise Harra, MSSL
Farid Goryaev, LPI & ROB

Instruments: **SWAP** + Hinode/EIS
(+ use of results of TESIS & SPIRIT for solar min/max)

Aims:
- Model inner solar corona
- Study quasi-stationary coronal streams from ARs
- Determination of physical properties of local magneto-plasma formations

Means:
- Global survey of the inner corona at rising solar activity, compare structure with min and max
- Search of solar wind streams from active regions & measure plasma parameters via DEM (hydrostatic scale of height & temperature in coronal rays)

Specific Observations: SWAP $1R_{sun}$ offpoint in 4 directions + follow AR ondisk & off-limb (9d)

Why PROBA2? only EUV telescope able to observe corona from limb to FOV coronagraphs

Time frame:

Costs: 2900€ (travel+living+ESWW7) & 2100€ (travel+living+EGU)

3. Study of Jet-like Coronal Phenomena in the Solar Atmosphere

Boris Filippov, Izmiran, Russia
Serge Koutchmy , France

Instruments: **SWAP** + other EUV imagers (other wavelengths)

Aims:
- Study coronal loop dynamics within "Eiffel tower" magn. configurations near and above limb
- Investigate relationship between small-scale photospheric **B** changes and the jet formation
- Study lateral motion of jet structures

Means:
- High-cadence, multi-wavelength (multi -T) data for thermal and spatial structure and sources
- Image processing procedures to highlight small-scale linear structures (Madmax operator)

Specific Observations: ??

Why PROBA2? high cadence SWAP

Time frame:

Costs: 5000€ (500€ travel + 4500€ living)

4. Transients and their role in heating and acceleration of the solar wind

Dipankar Banerjee, Bangalore , India
Krishna Prasad

Instruments: **SWAP** + jet observations of EIS, SOT and XRT (Hinode) and AIA (SDO)

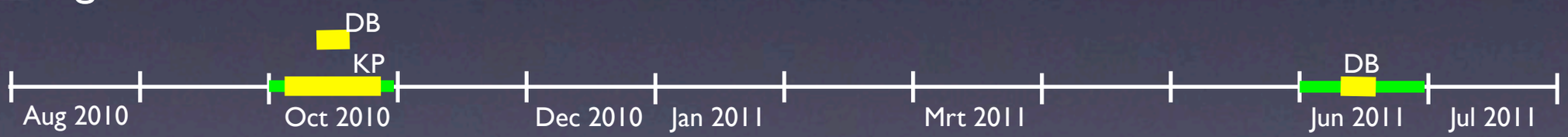
Aims:
Analysis of so-called chromospheric anemone jets and their links to Ellerman bombs, emerging flux and moving magnetic features in the framework of coronal heating.

Means:
Detailed analysis of chromospheric anemone jets in SWAP data combined with EIS, SOT and XRT on Hinode and AIA on SDO.

Specific Observations: continuous SWAP at high cadence, simultaneous with instruments above

Why PROBA2? high cadence of SWAP

Time frame:



Costs: DB: 5 days Oct + 5 days June: 2x1300€
KP: 21 days Oct = 2375€
Total: 4975€

5. Drivers and character of EIT waves

Ines Kienreich, University of Graz, Austria (PhD)

Instruments: **SWAP** + STEREO/EUVI + SDO/AIA

Aims:
- use the potential of PROBA2 to get insight into early evolution EIT wave and of its driver
- combine these results with the results obtained by STEREO/EUVI

Means:
- 3D observations when STEREO is in 180deg separation
- later also comparison to SDO data

Specific Observations: SWAP in high cadence observing EIT waves - detailed processing crucial

Why PROBA2? high cadence of SWAP & 3rd eye of STEREO

Time frame:

Costs: ??

6. Mass flows in the upper transition region and corona and their link to magnetic field reconnection events

Pia Zacharias, Kiepenheuer Institut, Germany (postdoc)

Instruments: **SWAP** + **LYRA**

Aims:
- Link mass flows in TR and corona to magnetic field via 3D MHD models

Means:
- SWAP: investigate mechanisms by which solar flares are driven high in the solar atmosphere
- SWAP: observation of EIT waves & off-limb observations for limb eruptions
- LYRA: sub-second structure of the solar flux

Specific Observations: not clear

Why PROBA2? high cadence of LYRA & SWAP

Time frame:

Costs: Requests Travel costs + living expenses + international conference (which one?)

7. Studies of coronal holes and solar wind velocity forecasts based on SWAP data analysis

Yulia Shugay, Institute Nuclear Physics, Moscow

Instruments: **SWAP** + EIT 195 + STEREO/SECCHI + SDO/AIA

Aims:
- Study statistical relationships between estimated CH parameters and the velocity of quasi-stationary solar wind (SW) streams, with neural network algorithms
- Use CH parameters with strong impact on SW flows to forecast the SW velocity at Earth

Means:
- Modify existing software for CH detection for use on SWAP data & calculate CH parameters
- Compare results for EIT 195 (done) & SWAP 174 (new)
- Use CH parameters with have strong impact on SW flow formation for forecast

Specific Observations: long period of SWAP observations, simultaneous with EIT, SECCHI, AIA + off-limb data for CH divergence factor (PI for SWAP specific CH software & processing)

Why PROBA2? need for multi-wavelength analysis + high cadence + off-pointing ability

Time frame:

Costs: Travel 350-400€

8. Analysis of Macro-spicules and Jet-like Coronal Phenomena in 171 and 304

Ehsan Tavabi, Tabriz University, Iran
Serge Koutchmy, Boris Filippov

Instruments: **SWAP** + EIT shutterless 304A + XRT and SOT (Hinode) + Trace CIV

Aims:
- deepen spicules, macro-spicules and jet studies using the SWAP data

Means:
- look at coronal counterparts and see the relationships with the coronal short transient brightenings, including the multiple component brightenings
- Results will be compared with i/ the computer simulations implying several magnetic null points and ii/ the oscillation properties of the flux tubes

Specific Observations: joint, high cadence observations with instruments above & ground based

Why PROBA2? high cadence SWAP

Time frame:

(see also proposals 3, 9)

Costs: Travel + living costs ET: 3600€ (2 months)
Travel + living costs SK: 800€ (2 x 1week)

9. Analysis of the origin of CMEs observed by SWAP

Serge Koutchmy , France
E. Podladchikova (ROB), B. Filippov (Moscow)

Instruments: **SWAP** + SoHO, Stereo, Hinode(XRT), Trace and possibly SDO, Hα, XRT

Aims:
Analyze several typical CME events by taking advantage of the high cadence of the SWAP instrument of PROBA2

Means:
- multi-wavelength, multi instrument analysis

Specific Observations:
- first use the available SWAP data (started working on April 3 event)
- time series of 3-4 hours when a filament is rising with good probability to produce a CME

Why PROBA2? high cadence SWAP + FOV

Time frame:

(see also proposals 3, 8)

Costs: 1000€ (3x1week)

10. Cross-Calibration and Comparison of LYRA and SOLSTICE

Martin Snow, Univ. of Colorado, US

Instruments: **LYRA** + SOLSTICE on SORCE

Aims:
- comparison and cross-calibration between LYRA and SOLSTICE
- SOLSTICE measures the variability of Lyα and the Mg II index with 1 min cadence for one orbit per day, and this type of data could be usefully compared to the LYRA observations.

Means:
- very precise analysis of bandpasses, instrumental effects, precise pre-processing (PI expertise)
- check if Mg II index measurements can be used as proxy for variability in LYRA Herzberg

Specific Observations: JOPs with SOLSTICE

Why PROBA2? high cadence LYRA + SOLSTICE overlaps two of LYRA's channels: Lyman alpha and the Herzberg continuum.

Time frame:

Costs: Travel 1000-1500$

I 1. Study of CME Onsets and EUV waves with SWAP on PROBA2

Spiros Patsourakis, Greece

Instruments: **SWAP**

Aims:
- Track the radial and lateral expansion of EUV CMEs from the solar surface up to 2 R⊙,
- Determine the exact spatial and temporal relationship between the early EUV and WL CME
- Determine the nature of EUV waves.

Means:
- several methods to increase the CME visibility in the extended corona above 0.5Rsun
- various methods aiming to increase the image contrast
- detailed, stepwise analysis of each CME event (see proposal)

Specific Observations: ~5 events with SWAP off-points, 1min cadence, long exposures
CME events with a range of acceleration profiles

Why PROBA2? SWAP off-pointing capability + high cadence

Time frame:

Costs: Travel 400€

12. Study of the pre-eruptive and eruptive phase of filaments/ prominences in EUV 17.5 nm using SWAP telescope on PROBA2

Nandita Srivastava, Udaipur Solar Observatory, India
S. F. Martin2 and Olga Panasenco (US)

Instruments: **SWAP** + EIT 304 + Udaipur Solar Observatory Hα + DOT

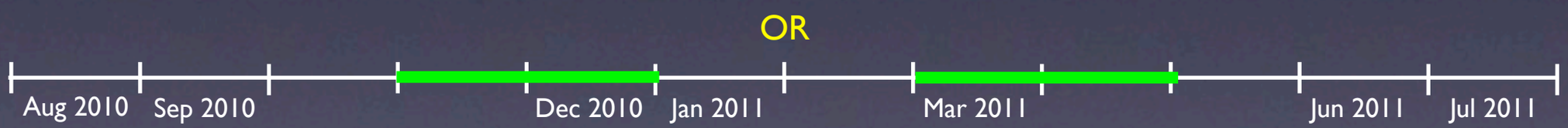
Aims:
1) Study the slow ascent phase of solar filaments/prominences -> find criterion on eruption
2) Study of roll effect in filaments/prominences

Means:
1) Compare cool plasma (304A) with hotter 171plasma and exploit high cadence & FOV SWAP
2) High cadence observations in 17.5 nm of roll effect + 3D reconstruction of filaments

Specific Observations: nominal SWAP images + JOPs with instruments above

Why PROBA2? high cadence & FOV of SWAP

Time frame:



Costs: Travel 1200€ + living expenses 2 months (maybe one more travel cost for student)

13. 3D coronal magnetic modelling of quasi-static corona & active regions (+SW monitoring platform)

Han He, National Astronomical Observatories, Beijing, China

Instruments: **LYRA** + **SWAP**

Aims:

1. construct a new integrated platform for solar weather monitoring, data sharing and forecast distribution
2. study and model the 3D coronal magnetic structure of the global quasi static corona, as well as the coronal magnetic structures associated with the solar eruptive events

Means:

- proposer already looked at SWAP and LYRA data online and they are suitable
- using the photo enhancement techniques on SWAP long exposures to obtain the clear off-limb coronal structure images with large FOV
- Record dynamic coronal structure variation of off-limb CME event

Specific Observations: SWAP long exposure times

Why PROBA2? quasi real time (suitable for SW) & large FOV + offpointing SWAP

Time frame:

Costs: ?? (5 weeks)

14. *Connection between solar flares and CMEs*

Claire Raftery, University of California, US

Instruments: **SWAP & LYRA**

Aims:
- Study flare-CME connection with SWAP & LYRA data: combine hydrodynamic evolution with CME kinematics.
- Use large FOV SWAP to fill the gap between EUV & WL imagers (location of CME acceleration)

Means:
- Follow entire acceleration phase of CMEs with SWAP off-points & analyze 17.4nm emission
- Analyze evolution of hot flaring plasma in same passband simultaneously
- Use LYRA data to identify long duration flares associated with CMEs & analyze HD evolution

Specific Observations: SWAP off-pointing during CME event & simultaneous LYRA data

Why PROBA2? off-pointing capability SWAP & simultaneous high cadence LYRA data

Time frame:

Costs: travel support not necessary (1 week 2010)

15. Reconstructing the solar variability from bandpass measurements

CESSATEUR Gaël, CNRS, Orleans, France
Thierry Dudok de Wit (LPC2E, Orléans) and Jean Lilensten (LPG, Grenoble)

Instruments: **SWAP & LYRA** & TIMED & SORCE

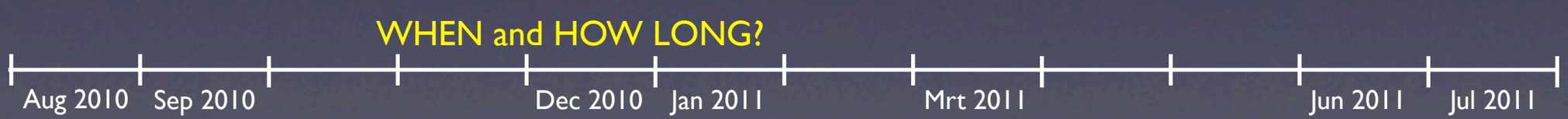
Aims:
Reconstruction total UV solar spectrum (27-280nm) from measurement of pass bands

Means:
- Use the calibrated signals of the 4 LYRA channels to reconstruct the solar UV spectrum with earlier developed method.
- Use SWAP as 5th LYRA channel. EVE/SDO can also be used.
- Analyze degradation in LYRA channels

Specific Observations: properly calibrated LYRA data & simultaneous SWAP data

Why PROBA2? UV channels ideal to reconstruct UV solar spectrum

Time frame:



Costs: ??

16. PROSIT (PROba2 SIMONE Interdisciplinary Teaching)

B. Bernert, H. Eckelt, German high-school teachers
T. Krauße, Planetarium Hamburg
V. Bothmer (Univ. Göttingen), N. Jakowski (DLR)

Instruments: **SWAP & LYRA** & SIMONE network (radio VLF wave receivers at German High Schools) & ACE (through Neustrelitz)

Aims:
Improve our understanding on the (E)UV impacts of the Sun on Earth's ionosphere. Solar flares influence VLF wave signal strength but no correlation with X-ray intensity.

Means:
- Joint analysis of solar & ionospheric activity through complementary Proba2 and SIMONE data
- Quantitative investigation of ionospheric impact through flares based on Proba2 data, with SWAP for spatial info, and LYRA data telling us the emitted (E)UV fluxes.
- Interdisciplinary teaching of joint Proba2 and SIMONE data
- Development of a permanent near-entrance display of PROBA2 & SIMONE data at schools

Specific Observations: simultaneous LYRA & SWAP data

Why PROBA2? LYRA necessary for EUV part of solar flare

Time frame:

Costs: 600€ (equipment) + 3000€: visit of 2 teachers + students (2x4days)

Selection Criteria

- Originality of scientific research
- Feasibility - Possible outcome (scientific paper)
- Exploitation of unique opportunities of PROBA2

- GIprogram sollicited young Ph.D-students & postdocs

⇒ Ranking

- Costs will define how many proposals we can fund
- Some proposals could be funded by other programs

Timeline

14 WHEN?
15 WHEN & HOW LONG?
16 WHEN?