OBSERVING TIME PROPOSAL FORM FOR NEW SOLAR TELESCOPE (NST)

Important Notes:

Two Proposal Submission Deadlines:

• 15 April 2015 for Session 1 (May 1 - June 30)

• <u>1 June 2015</u> for Session 2 (July 1 - 31 and September 15 - October 31)

1. Time window available for 2015: May 1 - July 31 and September 15 - October 31;

2. For the information of NST and BBSO, please visit http://www.bbso.njit.edu;

3. For the instrument information, feel free to contact Prof. Wenda Cao at wcao@bbso.njit.edu; 4. Final decision on telescope allocation for session 1 and session 2 will be made no later than April 25 and June 15 2015, respectively by BBSO Telescope Allocation Committee (TAC). High priority may be given to the PIs who produced good scientific results from the previous observations, to the proposals with scientifically challenging and achievable objectives, and the observing proposal with coordinated observations.

Make sure to submit your proposal in PDF format to Wenda Cao (TAC chair) via wcao@bbso.njit.edu before the deadlines

Qualified internal and external applicants:

1. Internal applicants refer to the scientific staff residing at BBSO, scientists and students in NJIT's Center for Solar-Terrestrial Research, and BBSO partners.

2. External applicants refer to the scientists and students from the institutes or universities in USA recognized by NSF or NASA.

3. The PI must have a PhD degree or be a PhD student with the supervisor as the Co-I.

Acknowledgement Requirement:

Please acknowledge BBSO and the instrument PIs in the paper relevant to this observation: BBSO operation is supported by NJIT, US NSF AGS-1250818 and NASA NNX13AG14G

1 General Information

1.1 Applicant Name and Affiliation

PI: V. Yurchyshyn New Jersey Institute of Technology

Co-I: A. Kilcik Akdeniz University, Turkey

*Note that Co-Is have the same data access rights as the PI. Please coordinate data access among team members.

1.2 Proposal Information

 \Box Renewal or continuation

 \Box Linked to an US NSF funding

 \blacksquare Linked to an AFOSR funding

 \Box Linked to a PhD thesis in preparation and led by a PhD student

 \Box A coordinated observation with a ground-based telescope

 \square A coordinated observation with a space-based observatory (e.g. IRIS or Hinode)

1.3 Observing Conditions

 \square Good Seeing

Sky Clarity

☑ Low Water Vapor

 \Box Specific Solar Activity

 \Box Quiet Sun Observation

 \Box Solar Limb Tracking

1.4 Preferred Observing Date and Time*

□ Fixed Date: 13 - 19 June 2015

 \square Flexible Date: 5 - 7 days

 \square Fixed Observing Time: 18:20:45 UT - 19:00:05 UT

☑ Suggested Observing Time: 16:30:00 UT - 22:30:00 UT

 \Box Program runs every day

^{*}Note that Fridays may be occupied for telescope engineering time.

2 Scientific Rationale

2.1 Title

Chromospheric Oscillations in Sunspots: Running Waves and Umbral Flashes

2.2 Abstract

These IRIS - coordinated observations are designed to measure umbral oscillations with high temporal resolution. We will be observing a large sunspot preferably with a light bridge.

2.3 Short Summary of the Request

2.4 Scientific Rationale

Study the spatial structure, dynamics and spectral properties of umbral flashes and spikes. In our recent study of one sunspot we found that bright umbral flashes (UFs) tend to appear in a form of lanes stretched along LBs and clusters of UDs, while weaker and diffused UFs appear elsewhere in the umbra. This finding is important since the LBs and UDs are the locations where the umbral loops are presumably rooted. This spatial correlation is suggestive that the enhanced heating by waves in the vicinity of LBs may contribute to heating of the umbral loops. We will use the list of sunspots simultaneously observed with IRIS and NST to study the bright lane UFs on a large data sample. In this study the spatial and temporal resolutions are very critical for the success of the effort.

2.5 Results from Previous NST Observations

Cho, K.-S., Bong, S.-C., Nakariakov, V. M., et al. 2015, ApJ, 802, 45

Yurchyshyn, V., Abramenko, V., & Kilcik, A. 2015, ApJ, 798, 136

Bong, S.-C., Cho, K.-S., & Yurchyshyn, V. 2014, Journal of Korean Astronomical Society, 47, 311

Vargas Domínguez, S., Kosovichev, A., & Yurchyshyn, V. 2014, ApJ, 794, 140

Yurchyshyn, V., Abramenko, V., Kosovichev, A., & Goode, P. 2014, ApJ, 787, 58

Abramenko, V. I., Zank, G. P., Dosch, A., et al. 2013, ApJ, 773, 167

Lim, E.-K., Yurchyshyn, V., Goode, P., & Cho, K.-S. 2013, ApJ Lett, 769, LL18

Yurchyshyn, V., Abramenko, V., & Goode, P. 2013, ApJ, 767, 17

Abramenko, V. I., Yurchyshyn, V. B., Goode, P. R., Kitiashvili, I. N., & Kosovichev, A. G. 2012, ApJ Lett, 756, LL27

Yurchyshyn, V., Abramenko, V., & Watanabe, H. 2012, Hinode-3: The 3rd Hinode Science Meeting, 454, 311

Goode, P. R., Abramenko, V., & Yurchyshyn, V. 2012, Physica Scripta, 86, 018402

Yurchyshyn, V., Ahn, K., Abramenko, V., Goode, P., & Cao, W. 2012, arXiv:1207.6418

Yurchyshyn, V., Kilcik, A., & Abramenko, V. 2012, arXiv:1207.6417

Lim, E.-K., Yurchyshyn, V., & Goode, P. 2012, ApJ, 753, 89

Kitiashvili, I. N., Abramenko, V. I., Goode, P. R., et al. 2012, arXiv:1206.5300

Abramenko, V., Yurchyshyn, V., & Goode, P. R. 2012, 4th Hinode Science Meeting: Unsolved Problems and Recent Insights, 455, 17

Kilcik, A., Yurchyshyn, V. B., Rempel, M., et al. 2012, ApJ, 745, 163

Abramenko, V. I., Yurchyshyn, V. B., & Goode, P. R. 2011, arXiv:1112.2750

Abramenko, V. I., Carbone, V., Yurchyshyn, V., et al. 2011, ApJ, 743, 133

Lim, E.-K., Yurchyshyn, V., Abramenko, V., et al. 2011, ApJ, 740, 82

Yurchyshyn, V. B., Goode, P. R., Abramenko, V. I., & Steiner, O. 2011, ApJ Lett, 736, LL35

Abramenko, V., Yurchyshyn, V., Goode, P., & Kilcik, A. 2010, ApJ Lett, 725, L101

2.6 List of Relevant Publications

Yurchyshyn, V., Abramenko, V., & Kilcik, A. 2015, ApJ, 798, 136

Yurchyshyn, V., Abramenko, V., Kosovichev, A., & Goode, P. 2014, ApJ, 787, 58

2.7 Expected Results

3 Observing Programme

1) TiO: 15 sec cadence. 2) VIS: Switching between -0.4Å and 0.4Å at about 5 sec cadence. 3) NIRIS: Standard settings.

3.1 Instrumentation Requirements*

- \square Adaptive Optics (AO-308)
- ☑ Broad-band Filter Imager (BFI)
- □ Fast Imaging Solar Spectrograph (FISS)
- \square Visible Imaging Spectrometer (VIS)
- ☑ Infrared Imaging Spectro-polarimeter (NIRIS)
- □ Cryogenic Infrared Spectrograph (CYRA)

\Box Other

*Note that FISS and VIS can't be used simultaneously. CYRA can't operate with all other instruments simultaneously.

3.2 Observational Strategy

3.3 Target and Conditions

a large sunspot