Splinter Proposal for Cool Stars 16
Title: Solar and Stellar Flares

1. Names of the session organizers, and primary contact information.

**Lyndsay Fletcher**  
Glasgow University, Glasgow, Scotland; lyndsay@astro.gla.ac.uk

**Petr Heinzel**  
Astronomical Institute, Ondrejov, Czech Republic; pheinzel@asu.cas.cz

**Hugh Hudson**  
University of California, Berkeley, California, USA; hhudson@ssl.berkeley.edu

2. A one-page discussion of the important science theme(s) to be covered in the splinter session, including why this is a timely topic for CS16.

Solar and stellar flares have striking similarities, so important parts of the underlying physics must match. There are also some apparent inconsistencies in the observations and in the model results that need to be understood. Unfortunately, the radical differences in the ways that flares are observed on the Sun compared to stars means that the communities have diverged. We therefore propose to initiate discussions to bridge this gap, via a splinter session on solar and stellar flares at Cool Stars 16. This will extend the discussion on flare chromospheres at a specialized (but small) international team meeting at the International Space Science Institute in Bern (see http://www.issibern.ch/teams/solarflares/ for some details). The solar observers can benefit from the broader stellar view of flare occurrence patterns, as well as their superior data in some wave bands (e.g., the all-important UV). Similarly there are observations (e.g. gamma-ray imaging), and theories on the solar side that do not have wide circulation among stellar flare aficionados.

This is a timely moment for a meeting on solar and stellar flares. The new solar cycle (24) has just started to produce flares and several new space-borned instruments are ready to observe them with unprecedented spatial and temporal resolution. Large flares were already detected in 2006 by the Hinode satellite, where three instruments (SOT, SXT and EIS) are well suited for flare detection and new observational campaigns are being proposed, including one that will be carried out in March, 2010. NASA’s SDO (Solar Dynamic Observatory) has been launched just recently, and is now being commissioned. With its several quasi-simultaneous, mainly EUV and UV channels, SDO offers new opportunity to collect a large amount of flare data. Complementary hard X-ray data come from RHESSI. There are many ground-based instruments that are ready to participate in observing campaigns including both spectrographs and high time resolution narrow band imaging. Observations in the microwave range (mm or sub-mm) are now also becoming available. In the future, ATST will be providing unprecedented
ground-based data.

On the stellar side, there has been renewed interest in flare campaigns on nearby, active stars, and on very low mass stars and brown dwarfs. Also, flares have been identified as an important transient signature in new imaging surveys such as PanStarrs and LSST, and precursor surveys that are already underway. Photometric monitoring missions that are searching for extrasolar planets both on the ground and in space are providing (as a welcome byproduct!) a wealth of new data on individual flares, and on flare statistics in many kinds of stars. Spectrographs on large telescopes can now obtain data in the far blue and near-UV to the atmospheric limit, and the revitalized STIS instrument on HST promises to allow additional stellar spectroscopy in the NUV and FUV regions from space, to complement photometry and lower resolution spectra from GALEX.

On the theoretical/modeling side, new scenarios have recently appeared and they need to be discussed in the light of the solar/stellar connection. With the development of massively parallel computing facilities, new challenges appear in the domain of radiation-(magneto)hydrodynamical simulations. For example, the process of beam heating as the primary energy transport mechanism in solar and stellar flares is still not well understood and new mechanisms have been recently proposed. Spectral syntheses from the simulations provide us with new constraints that need discussion between the modelers and the observers. Although the splinter session is rather short for such an extensive topic, we hope that the presentations and follow-up discussion will stimulate new mutual collaborations leading to a better understanding of solar/stellar synergy in flare physics.

3. A preliminary schedule, including a description of the organization of the session:

15 min. – introduction and general review of solar/stellar flare phenomena
30 min. – talk on recent solar flare campaign (instruments, data, results, challenges)
30 min. – talk on recent stellar flare campaign (instruments, data, results, challenges)
15 min. – refreshment break
30 min. – talk on solar/stellar flare models (physics, heating mechanisms, results, challenges)
30 min. – discussion of outstanding questions (see Section 5 below)
15 min. – discussion of new flare campaigns (new instruments and opportunities, coordination, comparison of solar and stellar results)
4. The names of potential speakers, and a plan for how additional speakers will be solicited and accommodated without overfilling the schedule.

Potential speakers include:


While the above suggested talks could be covered well by this group, we will also solicit expressions of interest (via the splinter website) from other people interested in attending the splinter session. Because we have 45 minutes reserved for discussion, we hope that there will be a lot of communication within the audience, perhaps with people bringing a slide to show their particular interest.

5. A description of outstanding questions/problems that will be directed to the other (non-speaking) participants during the group discussion.

There are many outstanding questions in flare physics, including:

1. What is the primary mode of energy release?
2. What is the heating mechanism for the lower atmosphere?
3. How is the observed radiation (continuum, emission lines) produced?
4. What observations are needed to constrain the models?
5. What new physics needs to be included in the models?
6. What is the best way to compare solar and stellar observations and models?

6. A (non-binding) list of likely participants. Also, please indicate request for either a large (200-250) or small (80) person lecture hall.

A lecture hall for 80 persons should be sufficient. Along with the potential speakers mentioned above, other possible participants that we are aware of (though we have not contacted all of them) include:


7. A commitment to set up a basic website to be linked to the CS16 public site, and to contribute a summary of the session to the CS16 proceedings.

We are prepared to set up a website and to contribute to the proceedings as requested.