

,September 26th, 2006

COST Action P-18 Lightning
Short Term Scientific Mission (STSM) Scientific Report

Michal Ganot, Tel-Aviv University, Israel

- **Applicant:** Michal Ganot, M.Sc. student, Tel-Aviv University, Israel
- **Host Institution:** Laboratoire d'Aérodynamique, Toulouse, France (Dr. Serge Soula)
- **Duration of STSM:** 2 week
- **Date of mission:** 5-20 September 2006

Dear Profs. Rachidi and Thottappillil,

My STSM took place in Toulouse, France on September 5-20th 2006. The main objective was to take part in the sprites observations conducted by Dr. Serge Soula of the University of Toulouse and his team. These observations were a part of the Eurosprite2006 summer sprite campaign in France:

(http://www.dsri.dk/sprite2006/raw_images/eurosprite2006/campaign2006.html).

I am part of the Tel-Aviv University (TAU), Israel, sprite research team, led by Prof. Colin Price and Dr. Yoav Yair (OUI). During the 2005/6 winter campaign, we used a mobile observation system which included 2 Watec cameras (a model 100N with a 12mm f/0.8 lens and a model 902H with 25mm, f/1.4 lens), GPS with time inserter, Pan-and-tilt unit controlled via the internet, and several event detection and image analysis programs. The successful results of sprite observations obtained during that winter campaign are soon to be submitted for publication (Ganot et al., First Detection of Transient Luminous Events Associated with Winter Thunderstorms in the Eastern Mediterranean, 2006, submitted; Greenberg et al., ELF Transient Associated with Sprites and Elves in Eastern Mediterranean Winter Storms, 2006, in preparations). The raw data is posted freely on the web at –

<http://geophysics.tau.ac.il/personal/ilan>.

The Toulouse group uses a mobile system that includes a Watec 902H camera with a 16mm f/1.4 lens, tripod, GPS and a laptop (with basically the same operation and analyzing software). During my STSM, I joined the Toulouse group observations and brought with me a mobile system from Israel, including the Watec 100N camera with 12mm f/0.8 lens, a GPS and time-inserter unit, and a tripod.

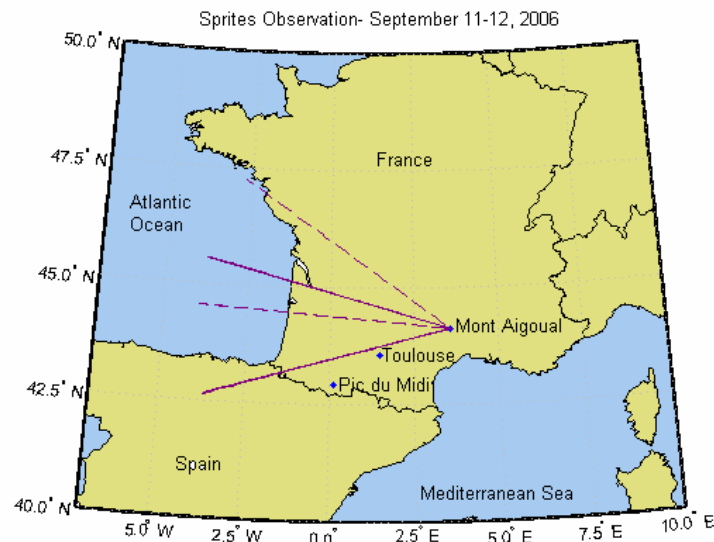
The STSM period had a lot of thunderstorms in the observation area, but unfortunately, most of these storms were without a clear line-of-sight to the area above the clouds, which is essential for observing TLEs. We had only one successful night of sprite observations: On the night of

September 11-12 we were in Mont Aigoual (44.121N 3.576E, 1500m), and captured 28 sprites within 5 hours over a storm occurring in the south west corner of France, about 350km from the observation point (see observation geometry in map-1).

By having two observation systems working side-by-side, we enlarged the total field of view, as we aimed the cameras in slightly different azimuths, with a small overlapping area. Indeed there are numerous sprites that were captured thanks to this viewing geometry (13 events captured with both cameras), while some of them were seen only partially on one camera, and their continuance were captured on the other one (see Figure 1a and 1b).

An additional direct contribution of the cooperation achieved during the STSM was the ability to obtain the accurate time of the sprite events. The GPS of the second unit (Toulouse team) was having troubles with a 1-second accuracy and it was not inserted into the video stream, (but rather updates the computer's clock instead). This led to inaccuracies in the time stamp when the video stream was analyzed by de-interlacing the fields of the frames (2 fields in each video frame). Thus, having another GPS with time inserter to the video stream helped getting a more accurate time of the events, and helped to calibrate the GPS of the second unit.

In addition to the optical observation itself, the analysis of the data from that successful night was done in collaboration with the two groups, having ELF data from a station in Israel (and also from Hungary in the future).



Map-1: September 11-12, 2006 Observation geometry.

Solid lines are the field of view of the Toulouse's camera, and the dashed lines are the field of view of the Israeli camera. Together with both cameras we get a larger field of view.



Figure-1: Sprite events captured by both cameras at the same time. Left image was taken Toulouse Watec902H camera and the right image was taken with TAU's Watec100N camera. Putting both cameras close-by but pointed at different directions, with a small overlap, allowed us to capture both of the sprites.

During my stay in Toulouse I had the opportunity to work closely with Dr. Serge Soula and Oscar van der Velde, who conducted an STSM to Israel during the above-mentioned 2005/6 winter campaign. The exchange of ideas on weather forecast for lightning activity, working together on analysis tools and techniques and the field campaign itself were extremely useful. The newly gained experience will no doubt have a positive impact on my future work in Israel, and it will be shared with the new generation of M.Sc. students joining our team.

Another advantage of this collaboration between the 2 groups is the continuation of the sprite observations throughout the year, as the sprite's season is different in both places: the sprites season in France is during the summer, while the sprite's season in Israel is during the winter. Thus, with 2 Cost's STMSs we had a continuance collaboration of 4 seasons, starting summer 2005 (Eurosprite2005), winter of 2005-2006 (Israeli campaign with STMS of Oscar van der Velde), summer of 2006 (Eurosprite2006 with my STMS) and the winter 2006-2007 to come (with perhaps another STMS).

Sincerely,

Ms. Michal Ganot, MSc. student

Tel-Aviv University