International Astronomical Union Symposium 223, Session 3, Saint-Petersbourg, june 14-19, 2004

Hα/He+ intensity variations of the cool corona

J-C. Noëns (1), M-F. Balestat (2), R. Jimenez (1), S. Rochain (2), D. Romeuf (3), F. Auchère (4), J-P. Delaboudinière (4) and S. Koutchmy (5)

(1) Observatoire Midi-Pyrénées ; Pic-du-Midi (France). noens@bagn.obs-mip.fr ;
*(2) Associated Observers * to Observatoire Midi-Pyrénées ; Pic-du-Midi (France) ;*
(3) Centre de Ressources Informatiques ; Université Claude Bernard Lyon 1, Lyon (France). David.Romeuf@univ-lyon1.fr ;
(4) Institut d'Astrophysique Spatiale ; Université Paris Sud, Orsay (France). Frederic.auchere@ias.u-psud.fr, boudine@ias.fr ;
(5) Institut d'Astrophysique de Paris-CNRS ; Université P. et M. Curie (France). koutchmy@iap.fr ;

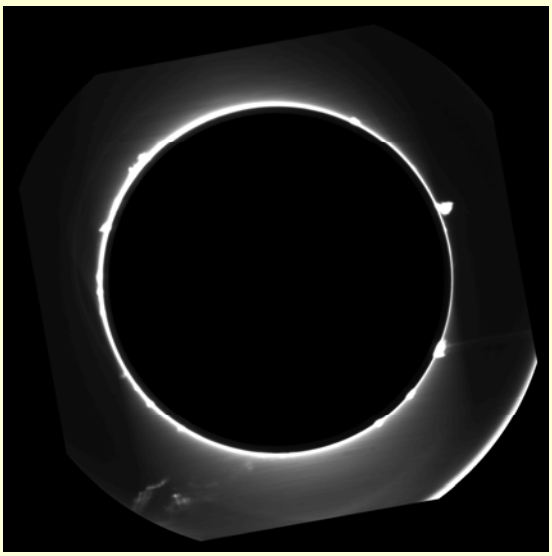

Fig.1 – Raw HACO Hα image, June 14, 1999 at 13:19 UT.

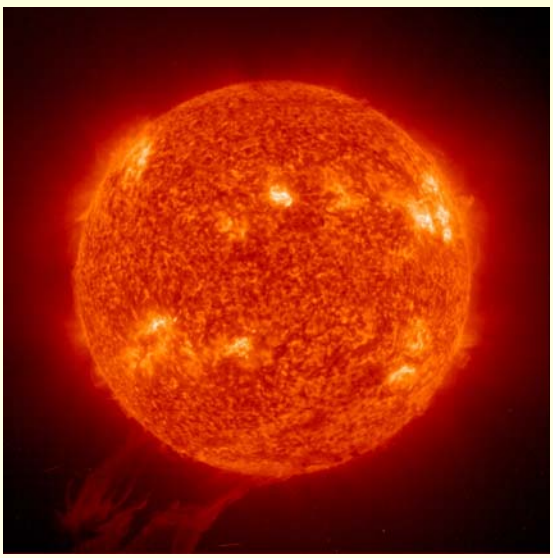

Fig. 2 – Raw EIT 304 image, June 14, 1999 at 13:19 UT.

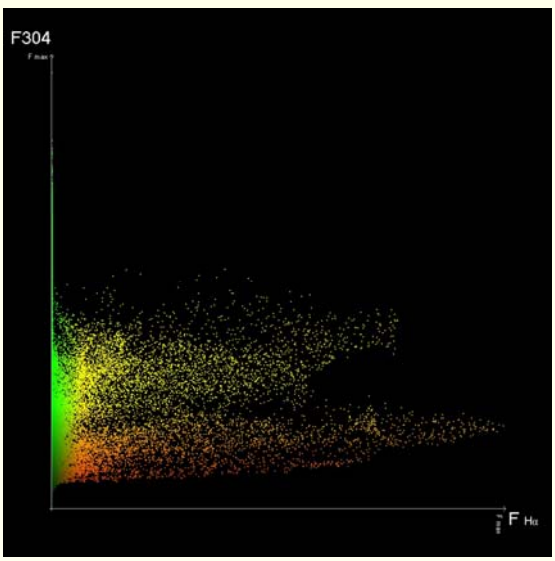

Fig. 3 - Correlogram 304 / Hα built using a sky background corrected Hα image and the raw 304 image. Yellow dots corespond to pixels where both Hα and 304 emissions are recorded. Green dots to the pixels with 304 emission alone and red dots to the pixels where Hα emission is alone.

Abstract :

We compare cool coronal emissions observed using i/ the routine groundbased Hα-coronagraph operated at the Pic du Midi Observatory and ii/ the He+ channel of EIT/SOHO instrument operated in space. Two strictly simultaneous filtergrams obtained on June 14, 1999 at 13:19 UT were selected to perform a correlation analysis of measured flux variations over the whole field of view. All cool emissions identified around the limb are considered. In addition emissions of a large eruptive prominence ocuring near the S-pole were analyzed; later a CME was recorded with LASCO coronagraphs right above this region. Both correlated and especially uncorrelated cool emissions appeared. Tentative interpretations are considered to explain the observed flux variations of hydrogen and helium emissions.

---*---

Outside the solar disk cool emissions are recorded. They are inserted into the surrounding hot corona and their properties are still not well known. Emissions from neutral hydrogen can be registered using the well known Hα line. With a coronagraph, it is possible to record Hα emissions through an interference filter broad enough to avoid Doppler effects. In these observations, we used a 0.3 nm width filter associated to a 15 cm aperture coronagraph equipped with a 16 bits 1K-CCD camera. An other type of cool emissions is recorded using the resonance 30.4 nm. line of HeII. The neutral hydrogen lines are emitted preferably near 8000 K; the resonance HeII line at 30.4 nm is preferably emitted near 50000K. The EIT instrument of SOHO records every day 4 images in the 304 channel when observing in the routine mode. Among the thousands of available images, we selected an image taken from the ground-based Hα observation at the same time (with a precision of 1 mn) as the HeII image taken from space, as a part of a time sequence covering the rather large polar region eruption event of June 14, 1999. The couple of images are then analysed in order to look at the possible correlation seen when Hα emissions are compared to HeII emissions OUTSIDE the disk.

Figures 1 and 2 show the raw images we analysed. Corrections were introduced to remove the spurious background of the Hα image but no correction (besides the usual geometric and global photometric corrections) was made for the 304 image in order to separate the HeII contribution from the SiXI hot coronal contribution which is especially important outside the chromospheric disk. Figure 3 shows the result of the correlation analysis. Although many points are present in both images (shown as yellow dots), it is premature to claim a correlation between both emissions because no definitive relations appears between the corresponding flux values. Instead of a correlation, two horizontal branches are noticed on the correlogram without apparent significance. Finally, figure 4 shows more qualitatively how emissions are spatially distributed, including the case of the dynamical event (prominence eruption observed with HACO in Ha during the whole sequence). We clearly see that cool emissions are difficult to evaluate in the 304 image because the contribution (shown in green) of the SiXI line emissions recorded simultaneously. We plan further to introduce a correction using e.g. the 195 EIT channel images taken well before and after. However, looking more carefully at the south part of figure 4 (E), we see that the problem is specially difficult to tackle in the case of the dynamical event, when both large proper motions and heating processes are simultaneously at work.

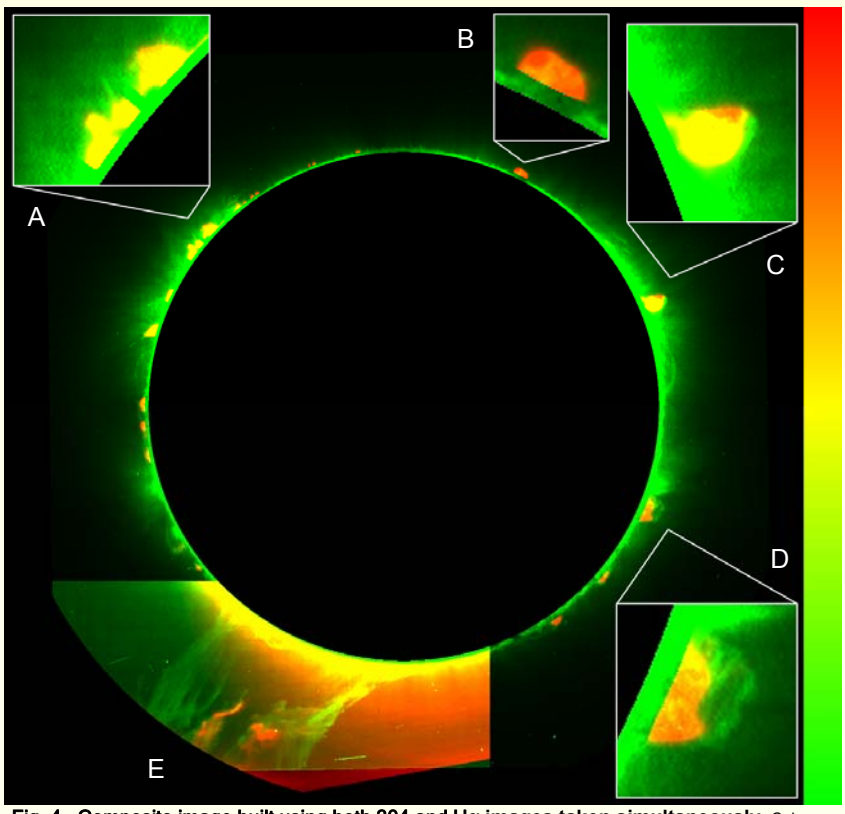

Fig. 4 – Composite image built using both 304 and Hα images taken simultaneously. Colors coding is as for figure 3. Note that the dominant green color background is mainly produced by the coronal emission due to the SiXI line blending the HeII line.

Aknowledgements : HACO is sponsored by PNST, OMP, UMR5572, FIDUCIAL and the Society of *Observateurs Associés.*

Technicals Aknowledgements : GNU GCC, Linux Debian, MySQL, T.Boutell projects ;

* Sponsored by FIDUCIAL-France