

2 .Summary on the current studies of the chromosphere.

The chromosphere is studied for a very long time on the ground, thanks especially to the imagery out of H β . Nevertheless, for a few decades, its study has not profited from the fantastic technological progress: i/ in space mission (UV), ii/ of the detectors (CCD) and finally iii/of computer processing (spectra and image processing; active optics etc). Nevertheless on the ground, it is curious to note today that often the chromospheric images with large field (full discs, etc.) of the Amateurs are better than those produced in the professional Observatories (see on Internet the images of Thierry Legault and those of Christian Viladric).

Hundreds of million dollars were spent for the study of the photosphere, including within the framework of the heliosismology, and as much at least for the study, in space, of the corona. One can however for a very long time make magnetograms with the line H D and even of other chromospheric lines, but no dedicated instrument was still developed to do it systematically and, especially, to take advantage of new technologies. Even with regard to the easier observation of tachograms chromospheric (maps of the vertical "constant" velocities) no dedicated instrument exists. Only deserving but rather hard attempts exist to set up an international network of observation of the whole disc out of HE], under the aegis of the US Observatory BBSO, starting from instrument existing in China, in Austria, in Sicily and in the USA. The instruments and detectors all are different and thus about impossible to intercompare photometrically. No serious calibration exists, neither in intensity nor in velocities. Other observatories in the World (Sacramento Peak; Kitt Peak; Meudon, etc.) produce comparable or better images, to diagnose the solar activity but without preoccupations of continuity or a calibration. No map of velocity fields nor of the magnetic field of the whole disc.

Californian observatory BBSO tests for a long time, under the influence of its famous creator the physicist H. Zirin, to promote the observations of images H11. It is thus besides the same for some theorists (in particular B Filippov and Mr. Molodensky who wrote a book on the subject) which see the means there of deducing morphology from the emergent field towards the corona. Thus the physics of the protuberances somewhat progressed thanks to this kind of image at high resolution (work of G Aulanier, T Amari and P. Demoulin in particular), and one knows the importance of the filaments to include/understand the eruptions for example (e.g.: work of B Schmieder). One can still indicate that the post-eruptive loops are observed perfectly on these images. In a more sophisticated way, morphology HD images carried out in the vicinity and the active areas give indications on the morphology of the emergent field and even, on the opening of the field towards the corona, including with regard to the horizontal component of the chromospheric field impossible to measure or predict by other methods. And what to say phenomena of torsion of the fibrous structures met around the inclined dynamic spots or of fibrils, without obviously counting the structures observed at the time of the eruptions of protuberances? It is also necessary to notice many works on the vertical velocities deduced starting from the approximation from the "cloud" model: from "cloud" optically more or less thin (P. and N Mein and coll. in Meudon). By inter-correlating after-images, it is also possible to deduce the horizontal components on these clouds. Of course, it is necessary to take account of speeds due to the oscillations of 3 and 5 mn, while

realising on sufficiently long intervals. The magneto-acoustics waves were measured perfectly there (Fr. Baudin, K Bocchialini, S. Koutchmy).

Lastly, some studies on the average total form of the chromosphere made it possible to deduce a significant lengthening in the polar direction (ovalization: Fr. Auchere, S. Koutchmy et al..) in period located around the minimum of activity. The problem is posed but it remains to make more systematic measurements. This lengthening is obviously in connection with the phenomenon of emergence of the field in the corona and the influence of the phenomenon on the rate of "levitation" of associated chromospheric cold gas.

With regard to measurements of magnetic field and the cartography of this field, very few modern measurements exist: on the line H(3, already rather deep, in China, and some measurements with SacPeak on Ha (S. Koutchmy et al..) of which measurements rather remarkable of parasitic polarity in sunspots, approximately 24H before it is not detected in photosphere and before eruptions (H. Dara, C Alissandrakis and S. Koutchmy).