

THE SOLAR MAXIMUM MISSION WORKSHOPS*

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Kundu, M.R., and Woodgate, B. (eds.) 1986: **Energetic Phenomena on the Sun** (NASA CP-2439).

Neidig, D. (ed.) 1986: **The Lower Atmosphere of Solar Flares** (Sacramento Peak Observatory).

Poland, A.I. (ed.) 1986: **Coronal and Prominence Plasmas** (NASA CP-2442).

Dennis, B.R., Orwig, L.E., and A.L. Kiplinger (eds.) 1987: **Rapid Fluctuations in Solar Flares** (NASA CP-2449).

*No formal paper was presented, but rather a review of the **Solar Maximum Mission** workshop series. The above list gives information about the currently published volumes. The discussion that follows dealt mainly with the "Thermal-Non-Thermal" (TNT) workshop presently under way (editors' note).

DISCUSSION

UCHIDA: I have two questions. One is about coronal transients. I think there was an argument about the three-dimensionality of the situation. Can the asymmetric picture explain this three-dimensionality?

STRONG: The asymmetry of the coronal mass ejections was an observational fact that was presented to us. What Richard Harrison has done is to have measured the angle from the footpoint of the coronal mass ejection to the flare site and the angle to the other foot and taken the ratio of those two. He plotted that ratio as a function of frequency, and it grouped very, very close to zero in angle. There was a distribution somewhere near the center, indeed, but a lot of them were at only the footpoints.

UCHIDA: About the blue shift at or before the impulsive phase. Did the workshop produce any explanation given for this behavior? I'm working on the theory in this area.

STRONG: Let me say that the blue shifts were again just assumed to be indications of chromospheric evaporation, and in fact some of the work that Dick Canfield has been doing with Dominic Zarro tends to support that with some of the recent XRP data. We have found for example momentum balance between the downward moving chromosphere and the upward moving material in the corona.

UCHIDA: I am specifically asking whether the evaporation explanation applies even before the establishment of the hot region at the loop top.

STRONG: The world's leading expert is standing right next to me!

CANFIELD [not blushing]: I've always argued that this process of heating of chromospheric material and expansion into the corona is inevitable, and that any time you introduce heat into the corona this process will take place.

STRONG: We don't see it before the impulsive phase because the statistics are too low. It is a question of sensitivity.

MOORE: I'd like to comment on those two questions of Uchida. The first one, about the the asymmetry of the mass ejections: it seems to me that a very likely explanation for that is the thing that Marcos Machado has pointed out, that a lot of flares don't have just a single neutral line. Many flares involve more than one neutral line and this can be just another example. If one guy pops off here and there's another symmetric mass ejection that goes off from an adjacent neutral line, that's a possibility that should be considered.

STRONG: May I comment on that. If it's in the same region, then the scale size is not large enough. These mass ejections are over many degrees of the solar surface. The angles that you are talking about may be 90 degrees or

more from footpoint to footpoint. It's not in the same region.

MOORE: I suggest you have something like an active region scale next to a very large-scale quiet region with its own neutral line - this is just a direct extrapolation of the Machado picture.

STRONG: OK, fine

MOORE: But I want to comment on both questions. About the blue shift from the beginning being due to evaporation, there were dissenting views on that. In particular, Dave Bachelor presented some X-ray pictures which suggest that perhaps because you see the X-ray brightening along the neutral line, that early on there is something like a filament eruption going on. It's a magnetic force rather than evaporation that gives you that observed signal. Not that the other process doesn't also happen.

ZIRIN: I have real problems with that evaporation picture. These started when Ester Antonicci asked me to look into the April 24 flare and its blue shift. The fact that it occurs about 5 minutes before the white-light flare means that it has nothing to do with heating near the surface. It's much more likely, as Ron just mentioned, to be the ejection of filament and that kind of eruption seen end-on; and the same was true of the June 6, 1982 flare. Those are the only two flares I'm familiar with in detail on this blue shift. I don't think there are too many cases, but my impression is that in almost every case the blue shift occurs very early in the flare and decreases with time and occurs before the peak of the white light. If you felt you had an evaporation process, it would seem to me that would maximize when you have the maximum heating of the surface. Yet, if you look at the movies of the thing, you see all this stuff blowing off, and that's the blue-shifted stuff, it seems to me.

STRONG: But the movies aren't in the same temperature regime as the soft X-rays we're talking about.

ZIRIN: Over the years we've found an exceptionally good correlation between these phenomena. As you know, when you heat this stuff up you've got everything in there from 100,000 K to millions of degrees. I agree with you that it is rather remarkable that a filament should blow off and show up as an Fe XXV or Ca XIX shift. I think really that you heat this stuff up so darned fast, though.

STRONG: You said that you don't know of many events. Well, just about any event I would argue would have some blue shifts early on in it. Any flare you have data on we can compare this on. Welcome to the workshop!

SPICER: I'd like to say a comment or two concerning your comments about theorists and observers. I don't want to make it sound like a criticism, but while I was at Headquarters I took the time to compare the theory budget with that for observations. Now that sounds like a little joke, but we're calling ourselves physicists first of all, and if you compare the budget for the astronomy and relativity program and the high energy astrophysics program in theory relevant to solar physics and go to any

other physics discipline which I took the time to do, like high energy laboratory physics, laboratory plasma physics, the proportion of theory vs. experimental work is roughly 25% of the budgets for theory and 75% for experiment. Now we're more like less than 10%. Another thing I find in dealing with observers personally, I think that observers have the same problem probably in dealing with me, and other theoreticians, is you comment about the different terminology. I really would like to suggest that at some point very soon we take the time to put together some educational workshops where we try to educate one another in our language, if that's what's necessary, because that's the only we're going to get the synergism that we need. And finally, relevant to the Solar-A program, every NASA program that I'm familiar with, except for the solar programs, and there's one exception to that and that's going to be the HRSO program, has a theoretical line item basically in their budget. The OPEN mission (which we now call the International Solar-Terrestrial Physics Program), has \$25,000,000 set aside for theory. That's one of the reasons that the ionospheric and magnetospheric people make a lot of headway. They have a very strong synergism between the observers and the theorists. We don't have such a thing, and for some reason we never put it in our budget and the observers don't ask for it. I'd like to recommend here that both NASA and the Japanese equivalent put together a theoretical program which is true theory; I don't mean data analysis now, I mean theory. I think you'll find if you do that, you will force the observers and the theorists to work together in a realistic way, like they do in the physics community, and you'll find there's going to be a lot more progress than there has been.

CANFIELD: I'm glad to see that the tape recorder was working during that comment! It had better appear in the proceedings!

ACTON: This isn't a question, it's a request. If you could make copies of your viewgraphs, of the agreements and questions, and distribute them to the conference participants, I think they're good material.