

## Scientific Report for Virtual Workshops

(maximum 2 pages)

### **Growth of Small Scales in Corona and Solar Wind**

14/6-18/6, Lorentz Center@Snellius

#### **Scientific**

##### *Short description of the aims for the virtual meeting*

The main aim of the meeting was to discuss the formation of small scales in the solar corona and solar wind. The scientific communities in these two fields are not often meeting at large conferences, which focus on these respective fields. The main aim was to have cross-over between the two communities.

As scientific rationale, recent years have shown a lot of progress in the numerical modelling and observations of small scales in the solar corona. Those small scales are directly measured in the solar wind close to the Sun by the Parker Solar Probe. To model PSP observations, input from solar coronal modelling is needed. Moreover, PSP observations and associated modelling put constraints on solar coronal properties. The two-way interaction between the two communities will thus lead to cross-fertilisation of both domains.

##### *Short summary of key moments (key debates, breakthroughs, etc.)*

Several points came up for further investigation after the workshop:

- The possibility of kappa-distributions in the corona and its self-consistent evolution to an accelerated solar wind has harvested a lot of attention, and this could be used in follow-up studies in the solar corona with PIC simulations.
- Counterpropagating Alfvén wave models of the solar corona do not seem to produce a significant heating, even though this is the basis for many solar wind models. Perhaps uniturbulence plays a more important role than we thought.
- The presence of the  $\lambda_{\perp}$  parameter in solar wind models was scrutinised. This free parameter of the models plays a major role in the temperature of the corona (in the models) and caution is needed in utilising it.
- On the last day, it was realised that the  $1/f$  spectrum can be created by the process of phase mixing. This was the key realisation in the workshop, because the solar wind community has already investigated this aspect for several decades. This was found in the solar coronal community by analytical models and confirmed with numerical simulations.

##### *Outcome(s)*

We think the main outcome of the workshop was to generate further collaborations between the fields. As can be seen in the above key moments, the transmission of information between the two communities was very successful. The interaction led to new realisations, even in decade-old problems, such as the  $1/f$  spectrum. Several of these new collaborations will lead to follow-up papers.

##### *Other comments*

At first I was rather sceptical about organising the meeting online, but afterwards, I have enjoyed it very much and gained a lot of new ideas.

## **Organization**

### *Preparation*

The workshop was prepared as a synchronous meeting, with talks at the set times allowing for scientific discussion afterwards. The programme was concentrated around noon European time, in a time block of 4 hours.

### *Duration of the workshop and time management*

The workshop took place in 3 blocks around European lunch time, with 2 long breaks. The breaks were especially intended to allow for the talks and discussion to run overtime. The last afternoon block was with talks of young scientists, followed by a group discussion.

### *Platform(s) used before and during the workshop*

The meeting was held in the Teams environment of the Leiden University. It mostly worked well, aside from some clashes with participant's own Teams account. Perhaps it would be worth trying to use the participant's accounts directly, and only offer new accounts to participants who don't yet have a Teams account.

For the coffee and lunch breaks, the wonder.me environment was used. For the people who came there, it was a good way of interacting informally. However, many people did not find it, perhaps because they wanted to have a proper break offline, or some because of technical issues. I heard from a Chinese participant that wonder.me was too slow for them to enjoy it.

### *Short- and long-term plans for follow-up*

During the workshop, it was suggested to have a similar workshop in the future, when in-person meetings are once again possible after corona-times. It was suggested to apply again to the Lorentz Centre in a few years or write an application to the International Space Science Institute in Bern (Switzerland). Moreover, people thought that also small scale meetings would be possible without such applications, in one of the institutes of participating scientists.

### *Lessons learned for future virtual events*

With a relatively small group, it is possible to organise such small scale meetings. The main disadvantage is the lack of coffee break and lunch time with other meeting participants. Also, it is much harder to interact with younger scientists, who don't get so much visibility in the online setting. Discussions are quickly dominated by senior scientists and junior scientists are apparently too shy to offer their opinion. Despite all these shortcomings, the meeting was appreciated well by the senior and junior scientists and yielded many interesting discussions.

### *Other comments*

NA

## **Lorentz Center (virtual) Support**

### *Comments/points for improvement for the Lorentz Center team.*

The preparatory meetings with the organisers are mainly aimed at people unfamiliar with conference planning. For us, a lot of the information in those meetings was not strictly necessary.

The support during the workshop was great.

**Tom Van Doorselaere** (Leuven, Belgium)

**Ineke De Moortel** (St. Andrews, UK)

**Marco Velli** (Los Angeles, USA)