Steady Jets and Transient Jets. Characteristics and Relationship

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FOREWORD

The conference ”Steady Jets and Transient Jets. Characteristics and Relationship” was held on 7-8 April 2010 at the Max Planck Institute for Radio Astronomy in Bonn, Germany.

The aim of the workshop was to review the current status of the knowledge about steady and transient jets ejected from the surroundings of compact, accreting objects. An important goal was to identify the physical mechanism triggering the change from one kind of jet to the other one. Jets are a common phenomenon in microquasars and AGN. Relatively recent results within the last ten years have brought compelling indications that the term “ relativistic jet” may in fact comprise two rather different types of relativistic flows. The first one results from magneto-rotational processes within an optically thick (flat or inverted spectrum) radio core region, from which a quasi-steady slowly moving jet emerges, with Kelvin-Helmholtz instabilities dominating its morphology and dynamics that are best seen in AGNs. The second type of jet stems from transient, flaring activity producing a transient jet which features a sequence of bright and typically optically thin regions that move at superluminal velocities, embedded in the structural patterns produced by instabilities in the underlying flow. These two types are called ”steady” vs ”transient” jet in the microquasar community and ”underlying” vs ”shocked” jet in the AGN community. X-ray observations of microquasars show that the steady jet is taking place in the ’low / hard’ X-ray state and the transient jet in the ’steep power-law’ X-ray state. That means that the two radio states correspond to two different X-ray states.

Observational results as well as theoretical aspects of jets were discussed in three scientific sessions. The first session was focused on the jets observations at different wavelengts, in a multi-band approach. MHD steady jet production and shock-in-jet theory were the topic of the second session, while the third session was dedicated to the important connection between jets and very high-energy emission, this last observed with Fermi LAT, AGILE and Cherenkov telescopes. In the meeting we have developed cross-disciplinary collaborations among astrophysicists, both theoreticians and observers, working on the same physical process of the ejection in different astronomical objects, as microquasars, AGN , gamma-ray bursts, jets around young stellar objetcs and the Sun with coronal mass ejection. The interaction has been very fruitful and one of the most interesting new result is the indication of magnetic reconnection as possible physical mechanism responsible for the switch from a steady to a transient jet. In the meeting, new collaborations originated from working on this topic and on the relationship between transient jet and gamma-ray emission. Over 50 participants came from Belgium, China, Croatia, Finland, France, Germany, England, Italy, Poland, Spain, Switzerland and USA. The essential aspects of jets were highlighted in 9 invited review talks (30 minutes each) held by experts in the fields. The topics were further explored in 27 contributed talks, each of them accompanied by a poster. Ample time was also assigned for discussions and poster sessions. The positive feedbacks we received, we saw that this combination of several reviews and posters plus short oral presentations was successful and we suggest this combination for future similar joint conferences.

Finally, we would like to thank the sponsors of the conference, the EU Consortium RadioNet and the Max-Planck-Institute for Radioastronomy. It was through their generosity that the local expenses could be covered and that the meeting was so well attended.

Maria Massi and Andrei Lobanov