

# RadioNet support for scientific events

## Application form for organisers

EVENT INFORMATION	
TITLE	Understanding the dynamics of the earliest phases of the star formation
PLACE	Haystack Observatory, Massachusetts Institute of Technology, 99 Millstone Road, Westford, MA 01886, USA.
ORGANISER'S INSTITUTE NAME	INAF-IAPS, Via Fosso del Cavaliere, 100. 00133 Rome, Italy. Alessio Traficante alessio.traficante@inaf.it
DATE	May 2019
NO. OF PARTICIPANTS	7 confirmed (Alessio Traficante; Jens Kauffmann; Thushara Pillai; Qizhou Zhang; S. Molinari; R. Paladini; M. Heyer), plus more to confirm including students
TOTAL EVENT COST	1800 euros
RADIONET SUPPORT	1800 euros
OTHER SOURCES OF FUNDING	No other sources of funding
REQUEST <i>(max. 2 pages)</i>	
Short abstract of the event	<p>The aim of this workshop is to push forward our understanding of the dynamics and the kinematics of massive star forming regions during the earliest phases of their collapse in light of the data acquired in 2 IRAM 30m projects. In particular, the goals of this 1-week small workshop are three:</p> <p>1) a 1-day meeting in the form of oral presentations and discussion to introduce the state-of-the-art knowledge about the dynamics of massive star-forming regions. In particular: a) what we know about the energy balance in these regions and the validity of the virial parameter to determine the equilibrium of a massive region; b) the global vs. local gas kinematics, with larger and larger evidences of gas with infall signatures at the parsec-scales also in regions with no hint of star-formation activity already started.</p> <p>2) the analysis and investigation of the recent 3mm data obtained at the IRAM 30m telescope under the project 040-18 (PI: Alessio Traficante), which aim to investigate one of the open problems in the context of the massive star formation: to understand if the ratio between the kinetic and the gravitational energy in massive star-forming regions, described by the virial parameter, is a good indicator of the dynamics of these regions. In particular, a crucial aspect of this analysis is to understand if the gas velocity dispersion estimated with a single gas tracer gives rise to a biased estimation of the kinetic energy of the explored regions. This problem has been recently explored by the participants of this workshop in a theoretical work published in Traficante et al. 2018, A&amp;A, 619, L7. The data obtained with the 040-18 IRAM 30m project are the first ones that try to investigate observationally this possible bias.</p> <p>With this project we proposed an innovative approach in which we explore the capabilities of an optically thin line, OCS (7-6), almost unexplored in the literature, to trace the kinematics of the low-density gas localized within the star-forming regions,</p>



	<p>without the contamination from the surroundings, and to compare directly with the kinematics derived with a more common tracer such as the <math>\text{N}_2\text{H}^+</math> (1-0), obtained within the same project.</p> <p>During the workshop we will 1) reduce the IRAM 30m data, thanks to the expertise of all the participants, and 2) produce a first comparison between the velocity dispersion derived using the <math>\text{N}_2\text{H}^+</math> (1-0) and the OCS (7-6) lines.</p> <p>3) The analysis of the data obtained using the IRAM 30m project 134-15, "First Galactic Census of the Coldest Milky Way Cores", PI T. Pillai. The goal of this project is to trace the 3 mm emission of a large sample of 110 clumps chosen to be 70 micron dark, with the aim of understanding the kinematics of the gas during the earliest phases of the star formation. During the workshop we will reduce the IRAM 30m data and we will investigate the dynamics of these regions in three ways: 1) we will derive the velocity dispersion of each of these regions using the optically thin <math>\text{N}_2\text{H}^+</math> (1-0) line, 2) we will investigate signatures of infall motions using the optically thick <math>\text{HCO}^+</math> (1-0), a clear indication that a parsec-scale collapse is already present at these earliest stages, as showed with other IRAM 30m data in e.g. Traficante et al. 2017, MNRAS, 470, 3882 and 3) we will study the dynamics at the very early stages of star-formation thanks to the combination of these data with the data obtained from the Herschel Hi-GAL survey, which will provide all the necessary information about the physical properties of these regions. The large sample of this project will produce a first systematic and statistically significant study of the 70 micron dark regions.</p> <p>This workshop will allow us to combine the expertise of the participants, which are PIs (and/or Co-Is) of these projects and all experts of IRAM 30m data, as well as of the Hi-GAL data.</p>
Relevance for RadioNet	<p>This workshop will permit the direct collaboration between PIs and Co-Is of two IRAM 30m projects. The scientific questions raised in these IRAM 30m projects require a deep knowledge of both the far-infrared data acquired with the Hi-GAL survey and the 3mm data acquired with the IRAM 30m facilities. The expertise of the participants at these wavelengths is well demonstrated by the scientific publications. This workshop will guarantee a scientific exploitation of these datasets and a first answer to a crucial question in the context of the Galactic star formation.</p>
Impact on RadioNet	<p>The unique capabilities of the IRAM 30m telescope to investigate the large-scale dynamics in massive star-forming regions will be clearly showed from the results of this workshop that will lead to, at least, two publications which will present the data acquired during the two campaigns. These results will also be presented in international conferences and are likely to put a major step forward towards the understanding of the dynamics in these regions. Finally, we also aim to start from these results to investigate a possible follow-up large-program that will fully explore the results of, in particular, the 040-18 project.</p>
Use of the RadioNet contribution	<p>The workshop will be held in Boston, where at least 2 of the participants are located. This will reduce the expenses of the workshop, as only the PI of the project 040-18, which is the proponent of this RadioNet funding (Alessio Traficante), will use the fundings.</p> <p>The estimated total cost for this 1-week workshop is 1800 euros. The cost of the Rome-Boston flight is estimated in ~1000 euros. The expenses for lodging, meal and travels in Boston are estimated in ~800 euros in total for the whole week. The workshop will be held in the conference Room D of the Haystack Observatory, Massachusetts Institute of Technology, which is organized in loco by Jens Kauffmann at no expenses. The other attendants agreed to travel with their own fundings.</p>
Ethics	<p>There are no ethics issues in this workshop.</p>
<p><b>Privacy Policy:</b> With signing this template and applying for RadioNet funding, I accept the <u>Privacy Policy of RadioNet</u>, which is based on the EU General Data Protection Regulation (GDPR).</p>	

Place & Date:

Roan, 31/01/2019

Signature of the applicant:

