Research Team name:

Thermofluid-mechanics and Heat Transfer (TFHT)

UNIVERSITY OF BERGAMO

Presenter name:
Ileana Malavasi

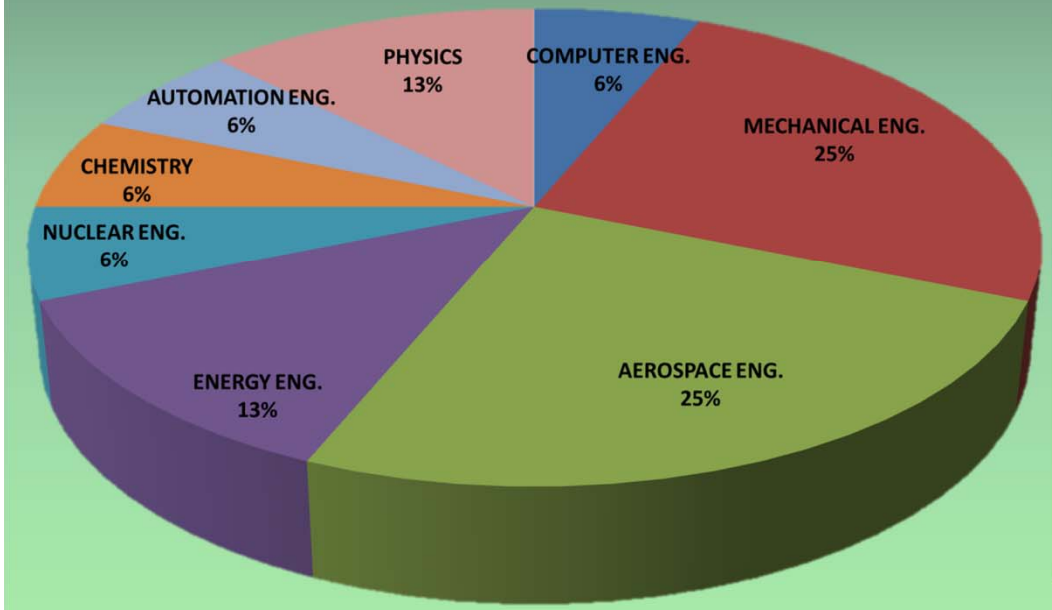
Team Presentation – Annual Workshop, COST Action MP1106
Dublin, September, 2012

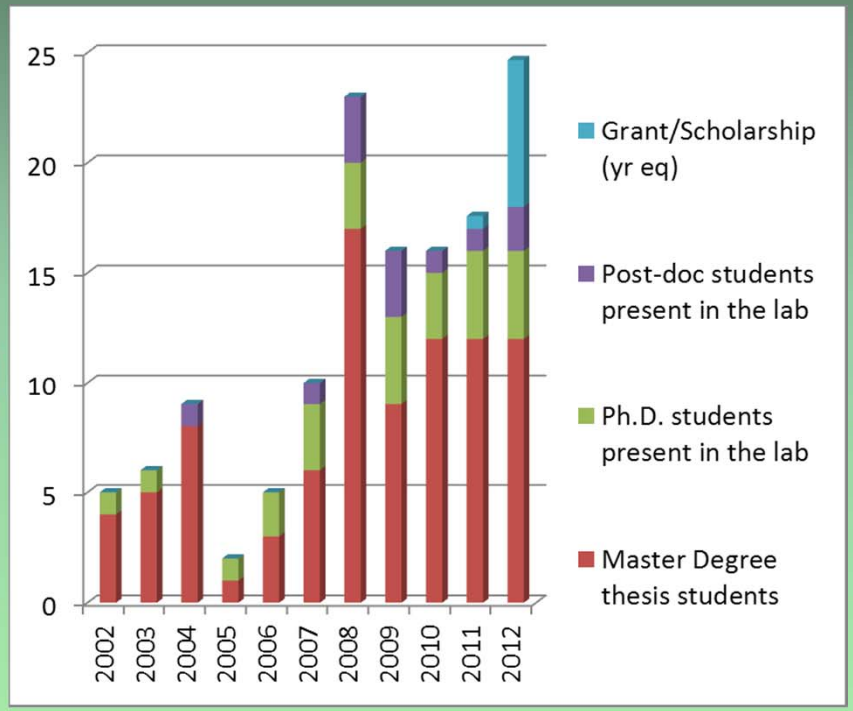
Thermal Physics Laboratory – UNIVERSITY OF BERGAMO

Team's general info

Research Team Name: **Thermofluid-mechanics and Heat Transfer**
Number of involved persons: 16 (Post-doc, PhD, Grant)

M. Marengo
Associate Professor, Bergamo University, Engineering Faculty, Italy





Lab description

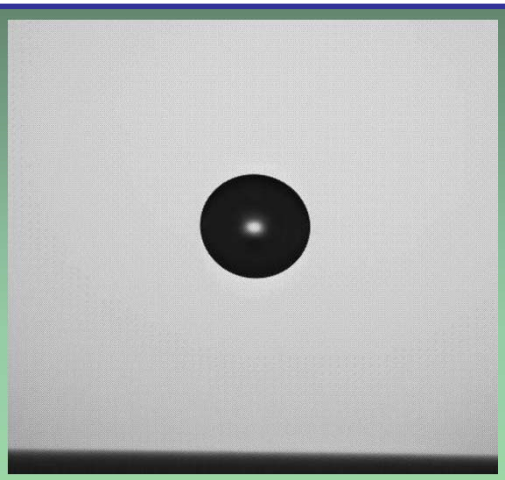
The group research field are:

- **thermal management** (heat pipe, plastic moulding, refrigeration, electronic cooling);
- **liquid interfaces** and **sprays** (drop impact, icing mitigation, surface functionalization);
- **two-phase** and **disperse flows** (spray, aerosol, fuel injection);
- **microfluidics** (injectors, ink-jet printing);
- **building physics** (thermal plants, energy saving).

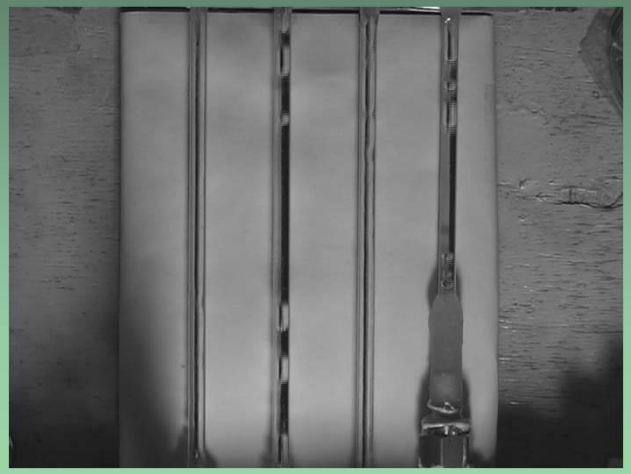
Relevance to MP1106

Research interests related to MP1106:

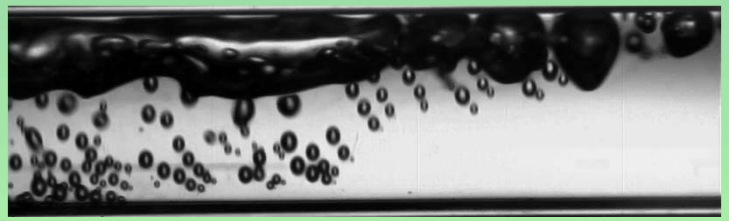
Liquid interfaces



Pulsating Heat Pipe (PHP)



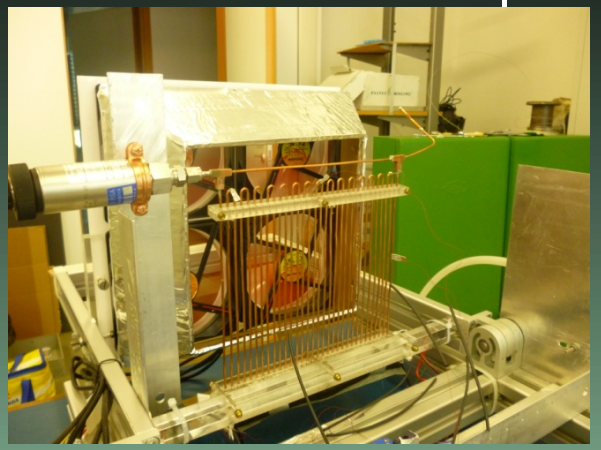
Flow boiling process



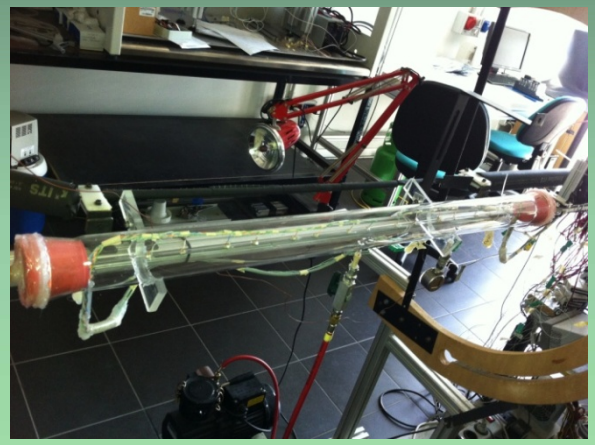
Lab description

Basic facilities, equipment, devices etc:

- thermal characterisation bench



- flow boiling test rig

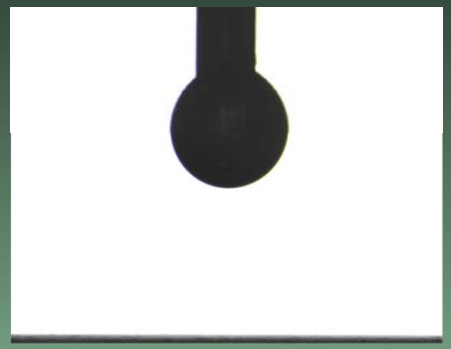


- drops impact apparatus

Projects

TECHNOLOGICAL DEVELOPMENT OF A PROTOTYPE FOR ICING MITIGATION SYSTEMS

Duration: 2011-2013
Funding organization: Alenia Aermacchi – Regione Lombardia
Number of people involved and their function: 4 (1 posdoc, 3 grant)



Facilities/equipment:

1) ***high-speed camera;***
2) ***icing wind tunnel (IWT)*** *– UoA, Canada.*

Most interesting results:

- rough surfaces with high CA and low CAH can reduce ic
- application of superhydrophobic surface in the leading e ction of required heating power (approximately 80% compared to accretion and a significant reduction of runback ice.

To do:
- wear test protocol;
- other tests to find out the parameters reducing ice accretion.

Example of ice accretion during IWC tests. Only the central part of the leading edge is heated.

UNTREATED ALUMINUM

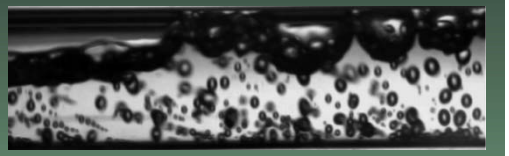
SUPERHYDRO COATING

cost EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Projects

EXPERIMENTAL AND NUMERICAL ANALYSIS OF FLOWS PHASE TRANSITION IN MICROCHANNELS IN GRAVITY AND MICROGRAVITY

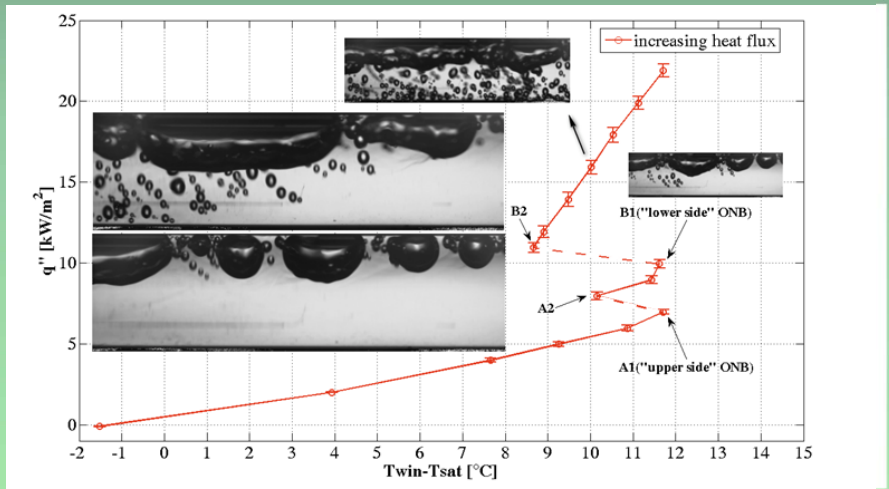
Duration: 2011-2013
Funding organization: MIUR (Italian Ministry of Education, University and Research)
Number of people involved and their function: 2 (1 Post-Doc, 1 PhD)



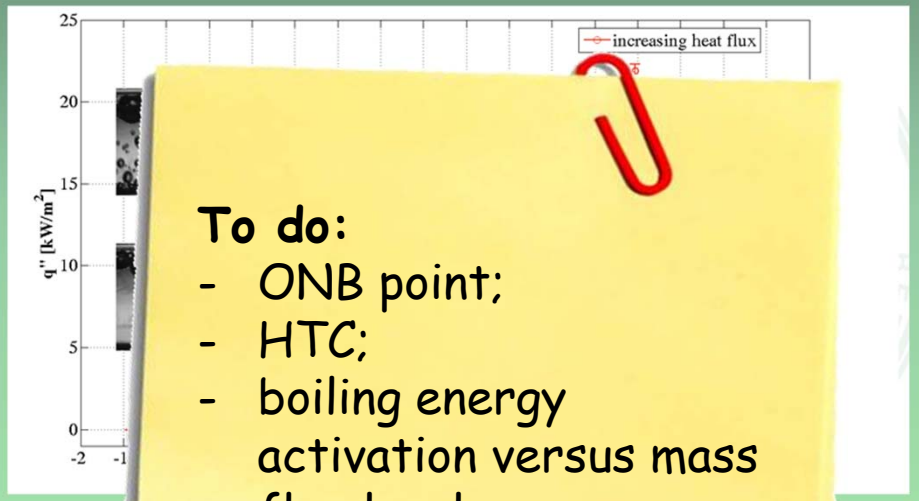
Facilities/equipment: ***glass minichannel enclosed in a co-axial glass tube vacuumed***.

Most interesting results:

- *the flow boiling process is heterogeneous.*



Mass flux level = 85 kg/m²s



To do:
- ONB point;
- HTC;
- boiling energy activation versus mass flux level.

Thermal Physics Laboratory – UNIVERSITY OF BERGAMO

Projects

CHARACTERIZATION OF THERMAL SYSTEMS WITH PHASE TRANSITION: SIMULATION, TESTING, ENGINEERING DESIGN

Duration: 2011-2013
Funding organization: Italian Space Agency, PRIN 2009
Number of people involved and their function: 3 (1 postdoc, 2 grant)

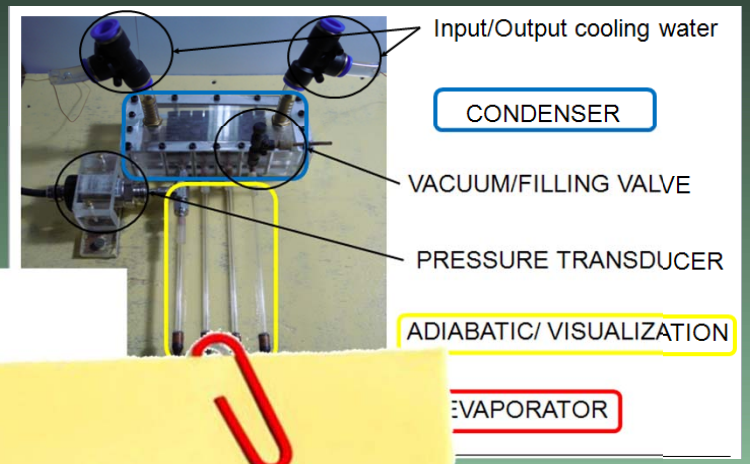
Facilities/equipment: **Pulsating Heat Pipes (PHP).**

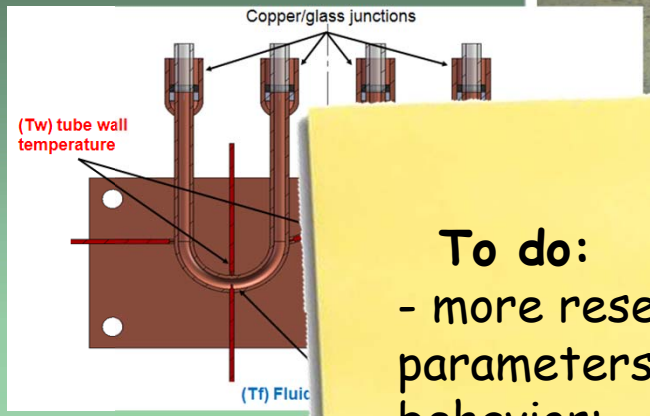
Most interesting results:

- measurement of the fluid and wall temperature and subsequent evaluation of the heat transfer coefficient;

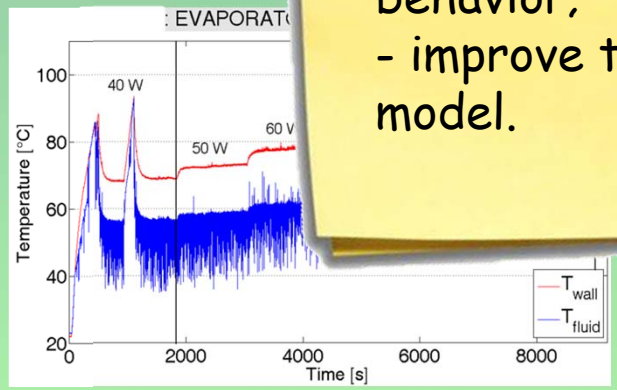
$$\tilde{h}_{ev} = \frac{\dot{Q}}{\Delta T_{w-f} * A_{ev}} [W / m^2 K]$$

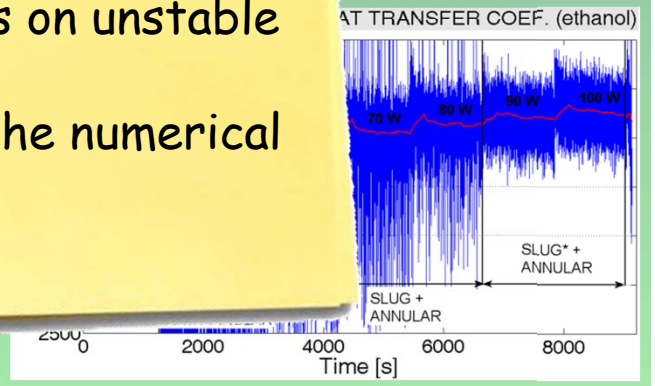
- preliminary numerical analysis suggests that the thermal performance of a PHP operating in ground conditions and horizontal position is equal to the microgravity operation at any orientation.





To do:
- more research on parameters on unstable behavior;
- improve the numerical model.





cost EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Thank you for your attention

Ing. Ileana Malavasi
Via Galvani 2, 24044 Dalmine (BG) - Italy
ileana.malavasi@unibg.it
+39 035 205 2067