Announcement of open Ph.D. position  
**Forest 3-D characterization using SAR tomography: techniques and applications**

SAR tomography is a coherent imaging technique from which may be derived 3-D maps of the electromagnetic (EM) reflectivity of complex environments, and which revealed particularly well adapted to forest characterization (to estimate height, density, underlying ground topography, biomass). It will be implemented for the first time in a spaceborne radar context, in the frame of ESA’s Earth Explorer mission BIOMASS, to be launched in 2020. In particular, studies conducted at CESBIO showed that robust biomass estimators could be derived using P band data, over tropical forests in French Guyana. An analysis jointly led by IETR and CNES further refined this approach and established an analytical relationship using a simplified structural model.

The work to be carried out during this Ph.D. study concerns three major axes of investigation:

- Evaluation of the generalization of results obtained in French Guyana to acquisition performed in Gabon during the AFRISAR campaign in 2015: pre-processing and 3-D focusing of airborne SAR data with precise topographic compensation, space-polarization decomposition, estimation, simulation of spaceborne BIOMASS data.
- Estimation of realistic structural features of a forest cover: development of advanced tomographic SAR techniques (adaptive parametric approaches, using simple EM models of a vertically structures medium), adaptive sparse parametric estimation adapted to data acquired with polarization diversity.
- Preparation of the future BIOMASS mission through the study of the temporal evolution of tropical forest scattering patterns: influence of meteorological conditions during the data acquisition cycle (rain, wind) as well as evaluation of the potential of synergy with other types of data, such as LiDAR acquisitions or L band data that may become available through a tandem spaceborne mission.

This work will be performed in cooperation with different research institutes involved in the preparation of the BIOMASS mission: CESBIO, IRSTEA, Politecnico di Milano, EDB, ONERA.

**REFERENCES**

**Organization** (start Sept./Oct. 2017, duration 3 years)
- Host institution: IETR (University of Rennes 1, France)
- **Supervision:** Laurent FERRO-FAMIL (IETR) (Dir), Dinh HO TONG MINH (IRSTEA), Thierry KOLECK (CNES)

**Candidate profile**:
- M.Sc. in Elec. Eng., Remote Sensing, Signal and Information Processing, Telecommunications...
- Basic knowledge in at least 2 of the following fields: radar, remote sensing, signal and information processing, wave propagation.

**How to apply:** **APPLICATION DEADLINE March 29th 2017**
Send a CV, official M.Sc. grade transcripts and at least one letter of recommendation to laurent.ferro-famil@univ-rennes1.fr, dinh.ho-tong-minh@irstea.fr, thierry.koleck@cnes.fr