The Terra Mobile Project

Emanuela Ene, Alexei Sokolov, Robert Brick, and Marlan Scully
Institute for Quantum Science and Engineering, Texas A&M University

We are developing a mobile platform, the Terra Mobile, for remote sensing atmospheric fauna and vegetation status. The Terra Mobile is a custom designed trailer that will accommodate laser systems, telescopes, and computers; it should function autonomously in the field for long periods of time.

Monitoring insects and studying their movements at a few meters above the ground is of great importance for public health and agriculture. The food industry that relies on insect pollination is a $200-billion world-business. The rapid detection of *Aedes* mosquitoes that are responsible of spreading the Zika and other viruses is of current interest. The significant changes in insect populations may represent measurable effects of environmental pollution. Neither radar, nor traps can provide accurate data of the insect movements close to the ground.

Figure 1 – Harvesting honeybees for system calibration at the RELLIS campus in Bryan, Texas

The automatic detection of pollinating insects, of bioindicators, and of disease vectors represents the top goal of our Terra Mobile project. We aim at a detection range spanning from a few meters to kilometers with a spatial resolution of a few centimeters. Although our optical setup for insect detection is a hybrid of several solutions published by other groups, we are developing novel real-time insect-identification algorithms. The preliminary calibration employed honeybees from the RELLIS campus of the Texas A&M University (Fig.1). Currently, we are training our machine-learning algorithms on data collected not only by us but also by other groups (Fig.2).

Figure 2 – Images from M. Brydegaard, A. Merdasa, A. Gebru, H. Jayaweera, S. Svanberg, *Realistic Instrumentation Platform....*, Applied Spectroscopy, 70(2) 372-385, 2016