**Doctoral Thesis Title**: 3D Mapping of Mediterranean Forest Fuels and Analysis of Fire Behaviour Variables.

**Supervisor/s**: Luis Ángel Ruiz Fernández

**Abstract**: Physical models of fire behavior require detailed 3D information on forest structure and composition (Mell et al., 2011). Advances in point clouds generation techniques, such as Airborne Laser Scanner (ALS), Terrestrial Laser Scanner (TLS), Mobile Laser Scanner (MLS) or Structure from Motion (SfM) from UAV on-board cameras, allow increasingly accurate estimates of the fuel density present in three dimensions (Wulder et al., 2012). Comparison of the predictions obtained by these techniques with manual measurements of vegetation would allow to determine the degree of predictable accuracy in model input and to explore the influence of certain parameters of vegetation structure and fragmentation on the potential spread of a fire (Pimont et al., 2011).
Thus, the main objective will be to explore and evaluate the operational incorporation of LiDAR point cloud-derived 3D forest structure variables into new physical models of fire behavior, and the simulation of different scenarios of wildfire spread in Mediterranean areas.
The tasks to be carried out can be summarized as follows: (1) Update of the literature review on the use of point clouds for fire behavior models; (2) Acquisition of field data; (3) Development of tools to transform point cloud data into useful inputs for fire behavior models, including (a) fuel modelling at voxel level, (b) automatic creation of files with information for fire behavior models (WFDS), and (c) automatically reading specific values from the output files; (4) Sensitivity analysis using different scenarios of bulk density, moisture content, species composition and 3D fragmentation of the forest structure, analyzing results such as fire spread rate, flame width and dry matter burned; (5) Interpretation and conclusions on the relationships of the 3D forest structure with fire behavior and dynamics, considering a climate change perspective.

**Available Means**: Thesis associated with the R+D+i project "3D spectral and structural mapping of Mediterranean fuel for fire behavior modeling (FireMode)". The means and equipment available in the CGAT-UPV group and the Department of Cartographic Engineering, Geodesy and Photogrammetry will be used, as well as equipment from external collaborators and members of the project team.

**References**:

Mell, W., McNamara, D., Maranghides, A., McDermott, R., Forney, G. , Hoffman, C., & Ginder, M., (2011). Computer modelling of wildland-urban interface fires. Fire and Materials, 531–544.

Pimont, F., Parsons, R., Rigolot, E., Coligny, F. De, Dupuy, J., Dreyfus, P., & Linn, R. R. (2016). Environmental Modelling & Software Modeling fuels and fire effects in 3D: Model description and applications. Environmental Modelling and Software, 80, 225–244.

Wulder, M.A., JC White, RF Nelson, E Næsset, HO Ørka. (2012). Lidar sampling for large-area forest characterization: A review. Remote Sensing of Environment, 121, 196-209.

**Supervisor/s Signature/s:**

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