

# Evaluation of Handheld Mobile Laser Scanner Systems for the Definition of Fuel Types in Structurally Complex Mediterranean Forest Stands

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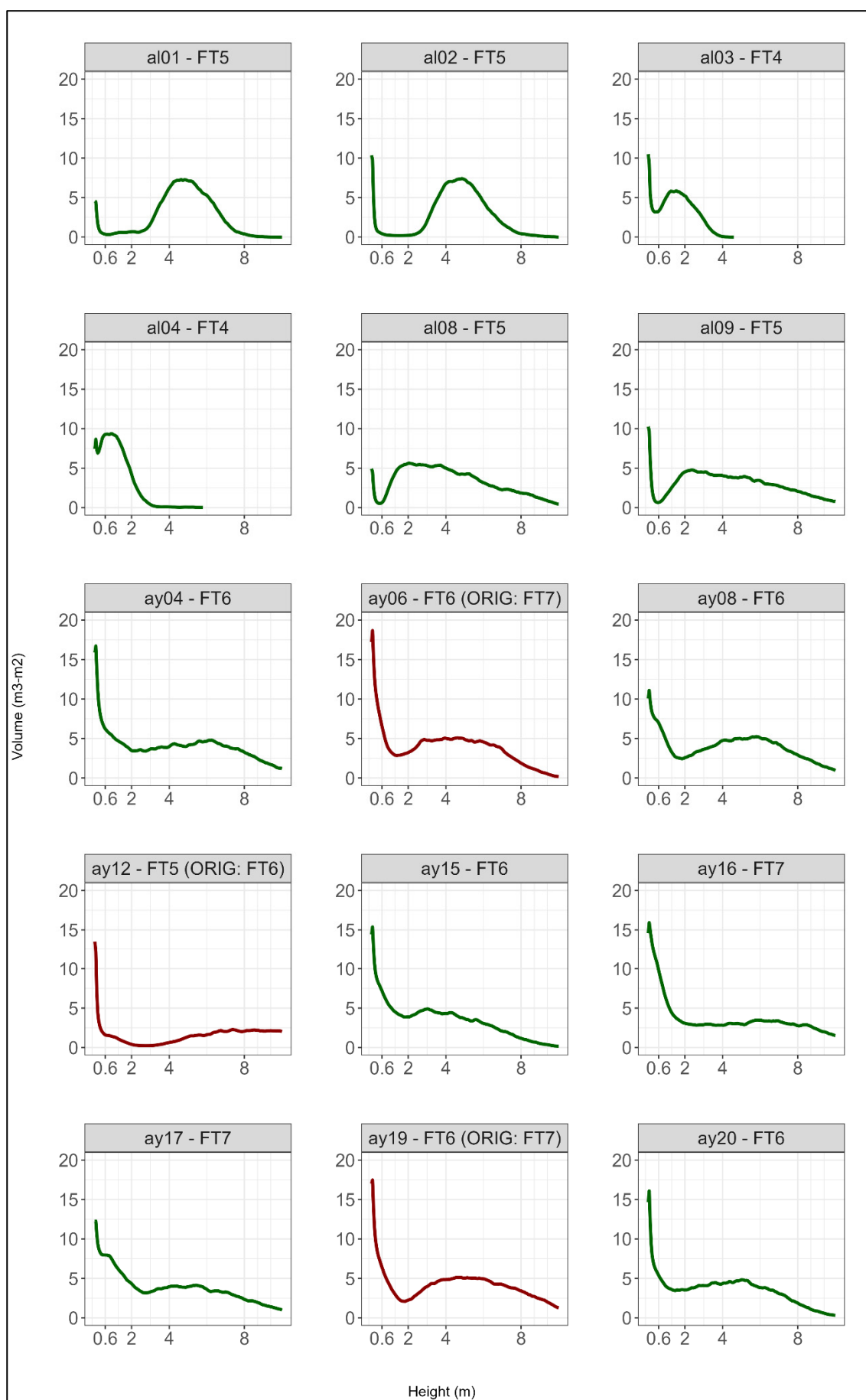
## Supplementary Materials

**Table S1.** Name, location, point cloud density, and mean georeferenced error of the forest plots. Plot 'zu38' have a 10 m circular radius.

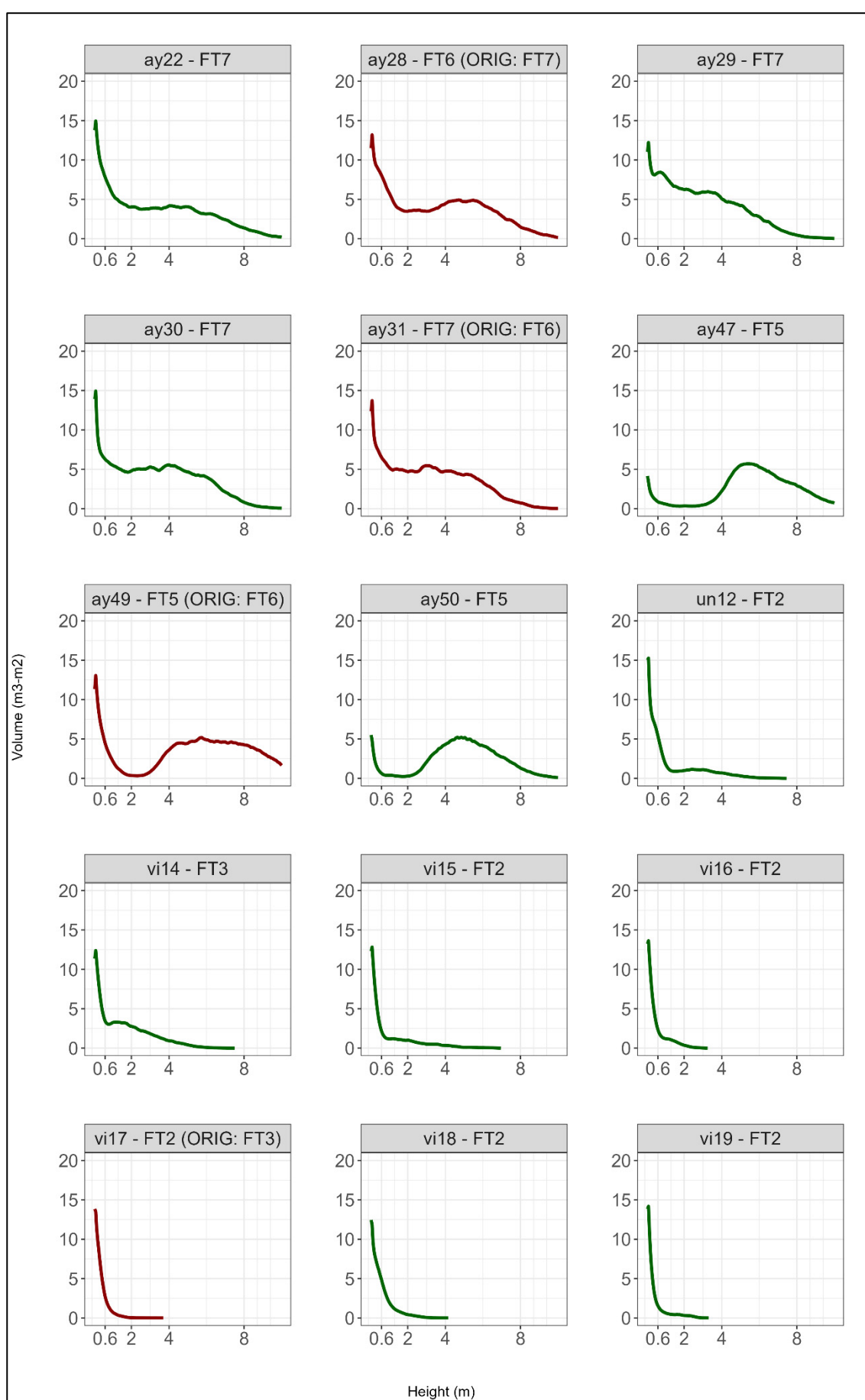
| Sector         | Plot  | Plot center (XY) (ETRS89 / UTM30N) | Points/m <sup>2</sup> | Mean georeferenced error (m) |
|----------------|-------|------------------------------------|-----------------------|------------------------------|
| Almudévar      | al01  | 694602,478 4652067,838             | 71,594.08             | 0.396                        |
|                | al02  | 694567,668 4652104,523             | 61,510.30             | 0.138                        |
|                | al03  | 710134,071 4663293,626             | 55,084.31             | 0.109                        |
|                | al04  | 710141,301 4663668,746             | 55,983.11             | 0.106                        |
|                | al08  | 697328,819 4653490,123             | 91,474.10             | 0.146                        |
|                | al09  | 697275,282 4653516,272             | 69,630.07             | 0.353                        |
| Ayerbe         | ay04  | 686687,048 4674577,984             | 133,259.23            | 0.058                        |
|                | ay06  | 688450,485 4674202,710             | 89,334.00             | 0.038                        |
|                | ay08  | 686536,466 4674651,836             | 84,663.50             | 0.585                        |
|                | ay12  | 685055,484 4672393,522             | 29,699.16             | 0.036                        |
|                | ay15  | 688256,466 4674080,083             | 80,750.19             | 0.090                        |
|                | ay16  | 688792,329 4674281,699             | 115,322.61            | 0.100                        |
|                | ay17  | 689248,872 4674261,269             | 131,697.66            | 0.155                        |
|                | ay19  | 686878,800 4673256,392             | 119,540.63            | 0.682                        |
|                | ay20  | 686703,732 4673179,904             | 84,514.25             | 0.472                        |
|                | ay22  | 687240,410 4673227,350             | 77,658.80             | 0.360                        |
|                | ay28  | 688371,236 4673218,006             | 82,040.58             | 0.213                        |
|                | ay29  | 688737,669 4673129,789             | 85,566.76             | 0.162                        |
|                | ay30  | 688775,135 4673342,463             | 78,094.99             | 0.134                        |
|                | ay31  | 688609,831 4673178,137             | 78,879.46             | 0.155                        |
|                | ay47  | 685130,090 4673135,506             | 31,830.43             | 0.205                        |
|                | ay49  | 685076,359 4672599,030             | 52,189.36             | 0.121                        |
|                | ay50  | 685122,505 4672511,905             | 24,966.82             | 0.136                        |
| Uncastillo     | un12  | 644240,822 4699753,646             | 46,152.96             | 0.133                        |
| Villarluengo   | vi14  | 727270,389 4511291,669             | 49,447.92             | 0.078                        |
|                | vi15  | 727036,262 4511166,454             | 35,912.14             | 0.122                        |
|                | vi16  | 727080,861 4511157,835             | 47,463.93             | 0.086                        |
|                | vi17  | 726201,413 4503645,777             | 26,659.39             | 0.096                        |
|                | vi18  | 726118,381 4503470,237             | 42,036.27             | 0.090                        |
|                | vi19  | 726672,818 4503511,043             | 17,187.46             | 0.080                        |
|                | vi20  | 726746,027 4503541,186             | 18,689.68             | 0.076                        |
|                | vi29  | 725332,834 4506874,651             | 31,546.16             | 0.036                        |
|                | vi30  | 725369,219 4506806,618             | 43,004.04             | 0.082                        |
|                | vi38  | 726062,493 4509797,786             | 50,681.73             | 0.119                        |
|                | vi39  | 725818,588 4509536,031             | 36,774.11             | 0.069                        |
|                | vi40  | 725846,450 4509684,009             | 32,018.89             | 0.099                        |
|                | vi41  | 726150,472 4509715,661             | 68,006.40             | 0.071                        |
| Zuera          | zu201 | 675701,773 4640029,063             | 49,040.58             | 0.063                        |
|                | zu202 | 675677,700 4640049,351             | 85,760.62             | 0.071                        |
|                | zu30  | 674321,251 4636134,801             | 47,760.41             | 0.123                        |
|                | zu31  | 674042,822 4636569,962             | 77,218.45             | 0.268                        |
|                | zu32  | 673137,179 4637107,172             | 23,244.28             | 0.141                        |
|                | zu38  | 674071,540 4639208,676             | 21,633.29             | 0.064                        |
| <b>Average</b> |       |                                    | 63,148.10             | 0.161                        |

**Table S2.** Mean height error (in meters) between the three ground classification algorithms tested in the study for each plot.

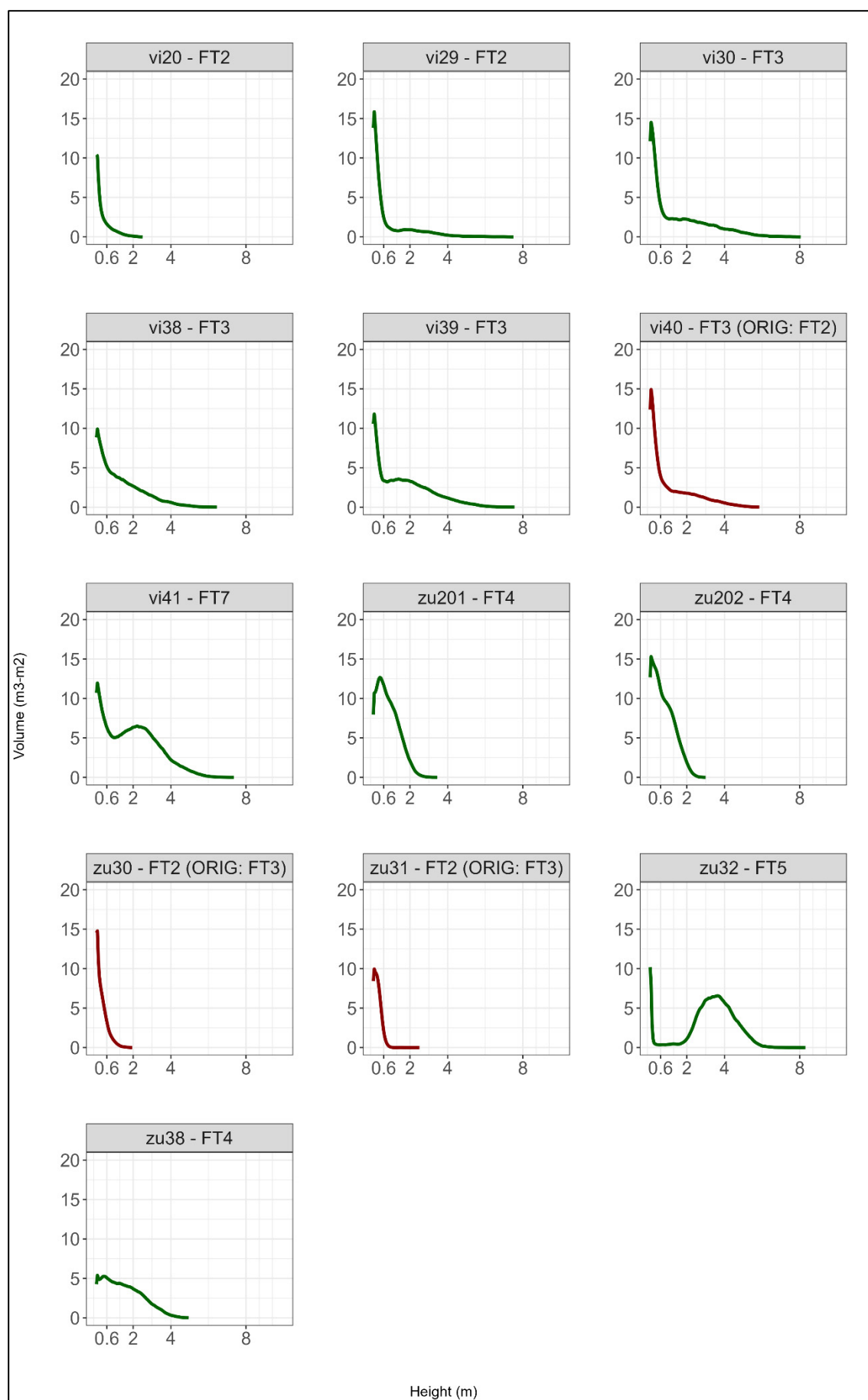
| Sector                    | Plot name | CSF-MCC     | CSF-LasTools | MCC-LasTools |
|---------------------------|-----------|-------------|--------------|--------------|
| Almudévar                 | al01      | 0.01        | 0.06         | 0.07         |
|                           | al02      | 0.02        | 0.02         | 0.04         |
|                           | al03      | 0.02        | 0.02         | 0.04         |
|                           | al04      | 0.04        | 0.05         | 0.09         |
|                           | al08      | 0.01        | 0.02         | 0.03         |
|                           | al09      | 0.00        | 0.03         | 0.02         |
| Ayerbe                    | ay04      | 0.10        | 1.84         | 1.74         |
|                           | ay06      | 0.01        | 0.16         | 0.17         |
|                           | ay08      | 0.05        | 0.31         | 0.26         |
|                           | ay12      | 0.02        | 0.10         | 0.08         |
|                           | ay15      | 0.03        | 0.24         | 0.20         |
|                           | ay16      | 0.10        | 0.55         | 0.45         |
|                           | ay17      | 0.04        | 0.39         | 0.34         |
|                           | ay19      | 0.00        | 0.35         | 0.35         |
|                           | ay20      | 0.03        | 0.10         | 0.12         |
|                           | ay22      | 0.06        | 0.28         | 0.22         |
|                           | ay28      | 0.01        | 0.27         | 0.26         |
|                           | ay29      | 0.01        | 0.10         | 0.11         |
|                           | ay30      | 0.01        | 0.12         | 0.11         |
|                           | ay31      | 0.01        | 0.12         | 0.13         |
|                           | ay47      | 0.02        | 0.01         | 0.03         |
|                           | ay49      | 0.00        | 0.15         | 0.16         |
|                           | ay50      | 0.02        | 0.02         | 0.03         |
| Uncastillo                | un12      | 0.02        | 0.17         | 0.19         |
| Villarluengo              | vi14      | 0.08        | 0.09         | 0.16         |
|                           | vi15      | 0.03        | 0.09         | 0.13         |
|                           | vi16      | 0.00        | 0.17         | 0.17         |
|                           | vi17      | 0.05        | 0.10         | 0.15         |
|                           | vi18      | 0.03        | 0.30         | 0.33         |
|                           | vi19      | 0.04        | 0.13         | 0.17         |
|                           | vi20      | 0.05        | 0.05         | 0.10         |
|                           | vi29      | 0.07        | 0.09         | 0.16         |
|                           | vi30      | 0.10        | 0.15         | 0.24         |
|                           | vi38      | 0.02        | 0.22         | 0.24         |
|                           | vi39      | 0.03        | 0.21         | 0.23         |
|                           | vi40      | 0.08        | 0.12         | 0.20         |
|                           | vi41      | 0.02        | 0.29         | 0.26         |
| Zuera                     | zu201     | 0.16        | 0.11         | 0.27         |
|                           | zu202     | 0.11        | 0.18         | 0.28         |
|                           | zu30      | 0.04        | 0.06         | 0.10         |
|                           | zu31      | 0.05        | 0.03         | 0.08         |
|                           | zu32      | 0.13        | 0.11         | 0.02         |
|                           | zu38      | 0.08        | 0.11         | 0.19         |
| <b>Overall mean error</b> |           | <b>0.04</b> | <b>0.19</b>  | <b>0.20</b>  |



**Figure S1.** Vertical distribution of the fuel volume of each forest plot every 5 cm (1/3).



**Figure S2.** Vertical distribution of the fuel volume of each forest plot every 5 cm (2/3).



**Figure S3.** Vertical distribution of the fuel volume of each plot every 5 cm (3/3).