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 Dataset Version: 1

Summary

This dataset provides pre-fire soil moisture and soil temperature profiles, and Live Fuel Moisture Content (LFMC) of six vegetation species collected at Sedgwick Reserve in Santa Barbara County, California, between July 20 and October 2, 2023. Soil moisture and soil temperature were measured using a METER TEROS 11 probe at standardized depths within soil pits dug near the time-of-flight overpass. LFMC for six plant species were collected via repeat visits to the same locations. Plant species include QUDO = Quercus douglasii (Blue Oak), QUAG = Quercus agrifolia (Coast Live Oak), SALE = Salvia leucophylla (Purple Sage), ARCA = Artemisia californica (California Sagebrush), PISA = Pinus sabiniana (California gray pine), and BUCK = Eriogonum fasciculatum (California Buckwheat). LFMC is computed as: $((\text{wet weight} - \text{dry weight}) / \text{dry weight}) * 100$. These measurements capture pre-fire baseline conditions and serve as a robust ground truth for calibrating airborne remote sensing instruments such as NASA's Scanning L-band Active Passive (SLAP) and Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR). The data are provided in text and NetCDF formats.

The soil moisture and temperature files are provided in one NetCDF file, and the vegetation data are provided in one text file.

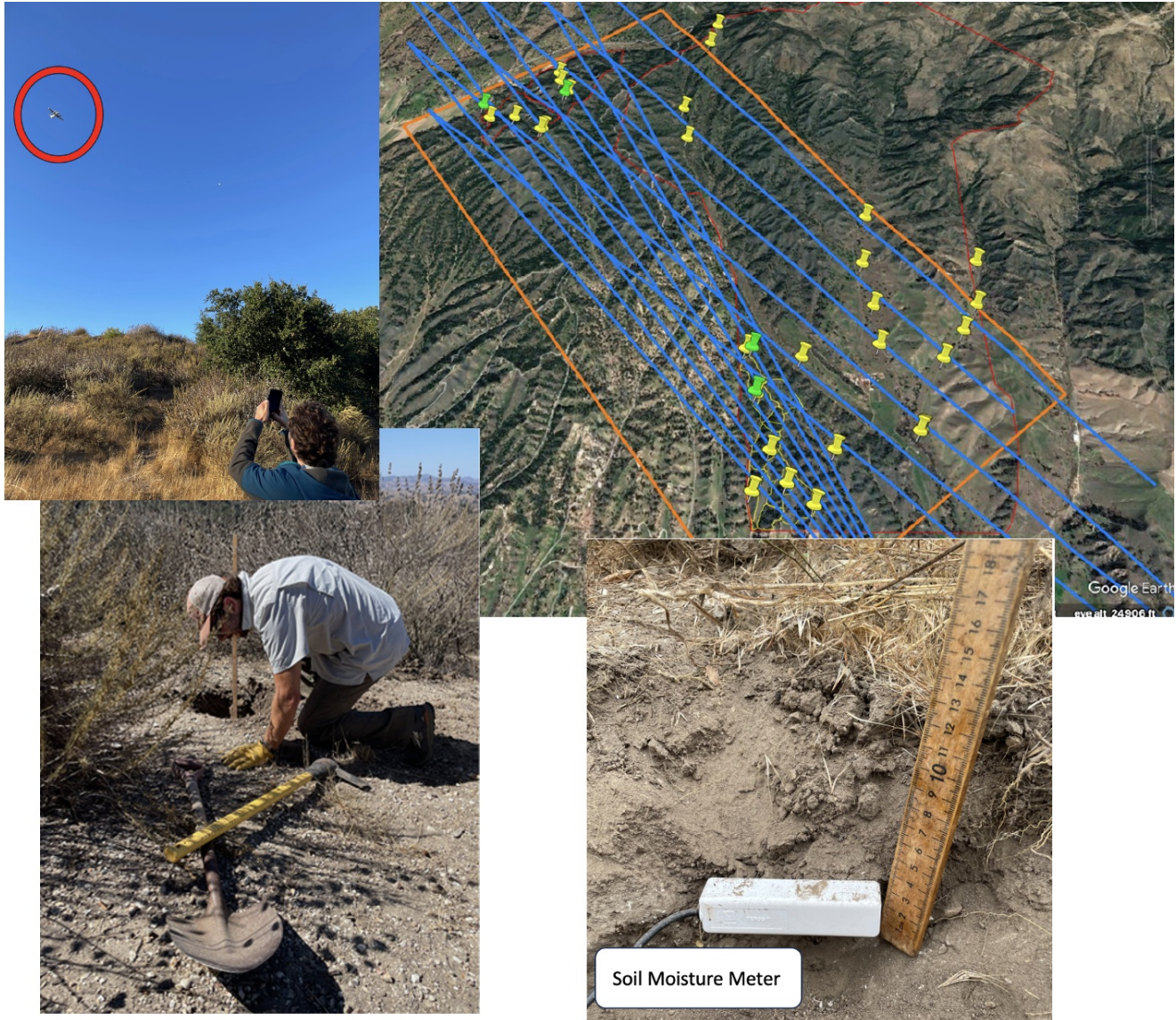


Figure 1. Pre-fire field work for the collection of soil moisture and temperature measurements for the calibration and validation of NASA's Scanning L-

band Active Passive (SLAP) and Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) instruments. Measurements were made at 20, 12, 6, and 0 cm depths at 134 sites over four days.

Citation

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1. Dataset Overview

This dataset provides pre-fire soil moisture and soil temperature profiles, and Live Fuel Moisture Content (LFMC) of six vegetation species collected at Sedgwick Reserve in Santa Barbara County, California, between July 20 and October 2, 2023. Soil moisture and soil temperature were measured using a METER TEROS 11 probe at standardized depths within soil pits dug near the time-of-flight overpass. LFMC for six plant species were collected via repeat visits to the same locations.

Plant species include QUDO = *Quercus douglasii* (Blue Oak), QUAG = *Quercus agrifolia* (Coast Live Oak), SALE = *Salvia leucophylla* (Purple Sage), ARCA = *Artemisia californica* (California Sagebrush), PISA = *Pinus sabiniana* (California gray pine), and BUCK = *Eriogonum fasciculatum* (California Buckwheat). LFMC is computed as: $((\text{wet weight} - \text{dry weight}) / \text{dry weight}) * 100$. These measurements capture pre-fire baseline conditions and serve as a robust ground truth for calibrating airborne remote sensing instruments such as NASA's Scanning L-band Active Passive (SLAP) and Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR).

Project: FireSense

The FireSense project is focused on measurable improvement in U.S. wildland fire management. This is accomplished by working with operational agencies responsible for wildland fire management to mature and deliver NASA's unique Earth science and technological capabilities. FireSense focuses on four use-cases to support decisions across the fire lifecycle before, during, and after wildland fires. These include the measurement of pre-fire fuels conditions, active fire dynamics, post fire impacts and threats, as well as air quality forecasting, each co-developed with identified wildland fire management agency stakeholders. Beyond the fire lifecycle, FireSense is intended to enable a transition from reactive to proactive fire response by facilitating increased preparedness and co-existence with fire through co-development of technology and data-informed tools with communities representing resource managers, policy-makers, and stakeholders at all levels. Starting in the fall of 2023, FireSense has an annual airborne and field component where the project tests and develops improved capabilities and technologies for transfer to stakeholders. FireSense leverages multiple airborne instruments, including MODIS/ASTER Airborne Simulator (MASTER), Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR), Airborne Visible/Infrared Imaging Spectrometer 3 (AVIRIS-3), Scanning L-band Active Passive (SLAP), and San Jose State University Wildfire Imaging System (SWIS).

Acknowledgements

This work was supported by the NASA FireSense Project. B. Markman and E. Scrivner served as excellent field assistants for this data collection effort. We are also grateful to the La Kretz Research Center director and staff, particularly K. Zum Dahl, for further outstanding field assistance and hospitality.

2. Data Characteristics

Spatial Coverage: Sedgwick Reserve, Santa Barbara County, CA

Spatial Resolution: Point measurements were made at soil depths of 20, 12, 6, and 0 cm

Temporal Coverage:

Vegetation collections: 2023-07-20 to 2023-10-02

Soil moisture and temp measurements: 2023-09-25 to 2023-10-02

Temporal Resolution:

Vegetation collections: a few times between July 20 and October 2, 2023

Soil moisture and temp measurements: every 15 minutes on each data collection day

Study Area: Latitude and longitude are given in decimal degrees.

Region	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Sedgwick Reserve, Santa Barbara County, California	-120.627	-120.025	34.743	34.680

Data File Information

There are two data files in this dataset: one file in NetCDF (.nc) format and one file in text (.txt) format.

FireSense-SoilMoisturePrl_Ground-Other_20230925_R0_thru20231002.nc

This file provides pre-fire soil moisture and temperature profiles collected at Sedgwick Reserve in Santa Barbara County, California, between September

25 and October 2, 2023. "R0" is the revision number.

FireSense-live-fuel-moisture_Ground-Other_20230720_R0_thru20231002.txt:

This file contains data for six plant species collected via repeat visits between July 20 and October 2, 2023, to the same locations indicated in the NetCDF. The species include QUDO = *Quercus douglasii* (Blue Oak), QUAG = *Quercus agrifolia* (Coast Live Oak), SALE = *Salvia leucophylla* (Purple Sage), ARCA = *Artemisia californica* (California Sagebrush), PISA = *Pinus sabiniana* (California gray pine), and BUCK = *Eriogonum fasciculatum* (California Buckwheat). Data are reported in ((wet weight - dry_weight) / dry weight). Multiply with 100, i.e., ((wet weight - dry weight) / dry weight)*100, to get Live Fuel Moisture Content (LFMC) percent values.

Table 1. Variables in the file *FireSense-SoilMoisturePrfl_Ground-Other_20230925_R0_thru20231002.nc*

Variable	Units/Formats	Description
Site	text	Abbreviated site names: MD = Midland Ranch, TREX = Training Exchange burn site at Sedgwick Reserve, UPPER = Upper portion of Sedgwick Reserve
Local Time	HH:MM	Sampling time (hour and minute) in Pacific Daylight time
UTCTime	HH:MM	Sampling time (hour and minute) in UTC
Stop Number	1	Sequential measurement number during AM or PM transit
Lon	degrees_east	Longitude of sample point (decimal degrees, WGS-84)
Lat	degrees_north	Latitude of sample point (decimal degrees, WGS-84)
Notes	text	Comments about measurements
SoilMoisture	m ³ m ⁻³	Volumetric water content of soil
TempSoil	degrees C	Temperature of soil

Table 2. Variables in the file *FireSense-live-fuel-moisture_Ground-Other_20230720_R0_thru20231002.txt*

Variable	Units/format	Description
Date	YYYYMMDD	Sampling date
Start_Time	HH:MM	Start time (hour and minute) in UTC
Stop_Time	HH:MM	Stop time (hour and minute) in UTC
Persons	text	Field person
Site Name	text	Site name
Species	text	Vegetation species
Number_of_Samples	1	Number of samples
Bottle_Weight	g	Bottle weight
Bottle_Sample_Wet_Weight	g	Bottle and sample wet weight
Bottle_Sample_Dry_Weight	g	Bottle and sample dry weight
Wet_Weight	g	Sample wet weight
Dry_Weight	g	Sample dry weight
Live_Fuel_Moisture_Content	percent	Data are reported in ((wet weight - dry_weight) / dry weight). Multiply with 100, i.e., ((wet weight - dry weight) / dry weight)*100, to get Live Fuel Moisture Content (LFMC) percent values
Notes	text	Notes

3. Application and Derivation

These measurements capture pre-fire baseline conditions and serve as a robust ground truth for calibrating airborne remote sensing instruments such as NASA's Scanning L-band Active Passive (SLAP) and Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR). Soil moisture and temperature profiles are useful for fire fuel models and are critical for calibrating and ground-truthing models based on microwave remote sensing observations.

4. Quality Assessment

Manufacturer-stated accuracy of the soil moisture measurement is +/- 0.03 m³ m⁻³, with a precision of 0.0010 m³ m⁻³. Manufacturer-stated accuracy of the temperature measurement is +/- 0.5 degrees C, with precision of 0.1 degree.

5. Data Acquisition, Materials, and Methods

Pre-fire soil moisture and soil temperature profiles, and Live Fuel Moisture Content (LFMC) of six vegetation species were collected at Sedgwick Reserve in Santa Barbara County, California. Soil moisture and soil temperature were measured using a METER TEROS 11 probe at depths of 20 cm, 12 cm, 6

cm and 0 cm, between 2023-09-25 and 2023-10-02 within soil pits dug near the time-of-flight overpass (Fig. 1).

LFMC for six plant species were collected via repeat visits to the same locations. After clipping, vegetation samples were placed in Ziploc bags and stored on ice during transport back to the field station. Wet weights were generally collected within 2-4 hours of sample collection. After wet weight collection, samples were placed into paper bags, dried overnight at 80 degrees C, and weighed the following day. Live fuel moisture calculations were performed in the lab upon measurement of the dry weight.

Plant species include QUDO = *Quercus douglasii* (Blue Oak), QUAG = *Quercus agrifolia* (Coast Live Oak), SALE = *Salvia leucophylla* (Purple Sage), ARCA = *Artemisia californica* (California Sagebrush), PISA = *Pinus sabiniana* (California gray pine), and BUCK = *Eriogonum fasciculatum* (California Buckwheat).

LFMC was computed as: $((\text{wet weight} - \text{dry weight}) / \text{dry weight}) * 100$. These measurements capture pre-fire baseline conditions and serve as a robust ground truth for calibrating airborne remote sensing instruments such as NASA's Scanning L-band Active Passive (SLAP) and Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR).

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

[FireSense: Soil and Live Fuel Moisture Content, Sedgwick Reserve, CA, USA, 2023](#)

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
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7. References

None cited.



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