Airborne radiometry experiments for the validation of the SMOS Algorithm L-MEB at the Valencia site (Spain)

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AIRBORNE RADIOMETRY EXPERIMENTS FOR THE VALIDATION OF THE SMOS ALGORITHM L-MEB AT THE VALENCIA SITE (SPAIN)

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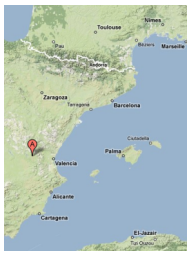
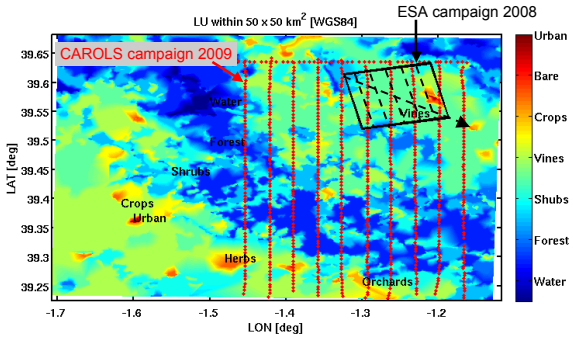
1. AIRBORNE CAMPAIGNS: ESA REHEARSAL CAMPAIGN 2008 & CNES CAROLS CAMPAIGN 2009



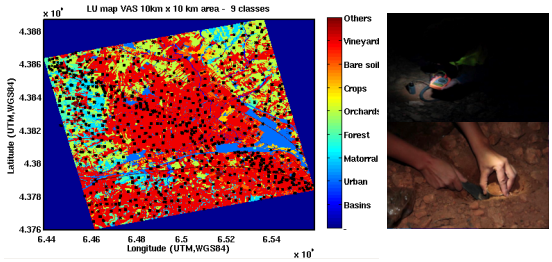
VALENCIA SITE (VAS)

Description	ESA REHEARSAL-2008	CAROLS-2009
Radiometer	EMIRAD	CAROLS
Frequency (GHz)	1400-1427 (-1dB)	1400-1427 (-1dB)
Polarisation	Fully polarimetric	Fully polarimetric
Radiometric sensitivity (K)	0.1 for 1-s integration	0.1 for 1-s integration
Antenna configuration	Along-track	Across-track
Antenna aperture (-3dB) (deg)	38° (nadir) 31° (off-nadir)	37.6° (nadir and off-nadir)
Antenna type	Potter horn	Potter horn
Footprint size at nadir (-3dB) (m)	600	3000
Footprint size off-nadir (-3dB) (m)	1000	5000
Nr. of flight lines per day (Nr of flights)	1 (3)	10 (3)
Area covered	10 km	26 km x 55 km

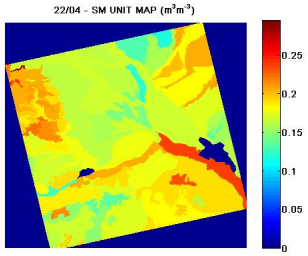


2. REFERENCE SOIL MOISTURE

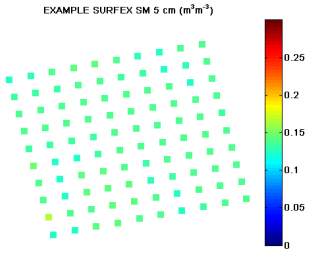
1) INTENSIVE FIELD MEASUREMENTS



2) MAPS OF HOMOGENEOUS SOIL MOISTURE UNITS



3) SURFEX-DERIVED SOIL MOISTURE



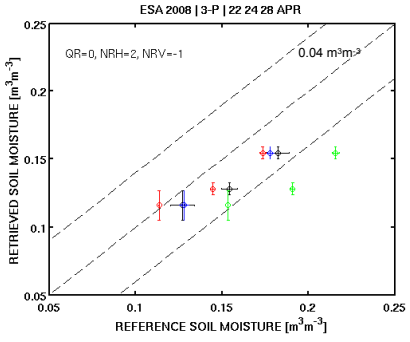
[EXAMPLE MAPS FROM ESA REHEARSAL CAMPAIGN, 2008]

3. MICROWAVE-DERIVED SOIL MOISTURE

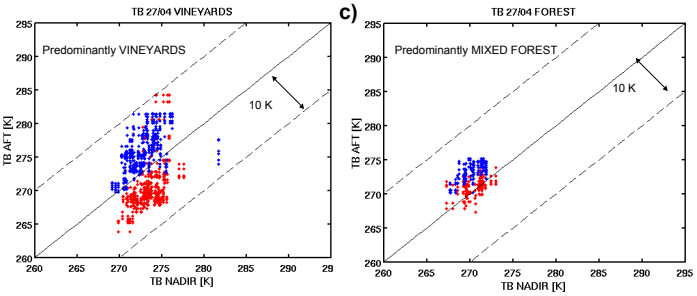
Soil moisture retrievals use L-band data at two angles and H, V polarisations + L-MEB modelling + detailed surface information (texture, land use). These data are used for the simulation of the brightness temperature (TB) vector [$TB_{X,\theta}$ $TB_{Y,\theta}$ $TB_{X,\phi}$ $TB_{Y,\phi}$] at the antenna level, where comparisons between modelled & measured TBs are performed for the retrieval of surface parameters.

ESA Rehearsal 2008: a) Retrievals of three parameters (3-P: SM, optical depth, roughness) from low-altitude flights over vineyards show good temporal correlation compared to average field SM (5 cm depth), SURFEX SM (2 cm depth), SURFEX SM (5 cm depth), and SM unit maps (5 cm).

a)

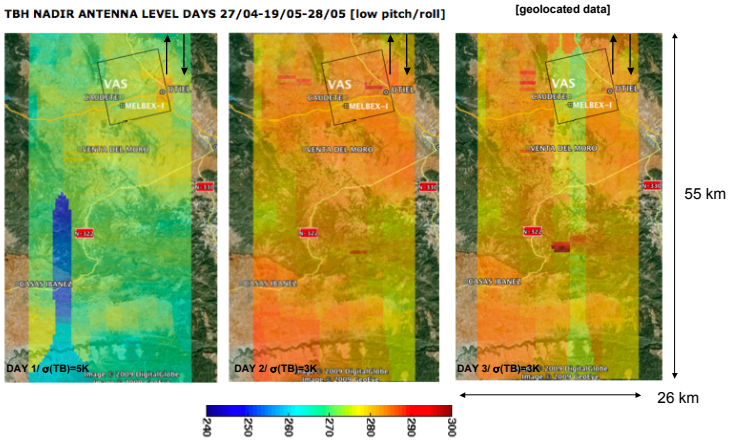


c)



CAROLS 2009: b) TB measurements at nadir over the whole area (day 1: dry, day 2: very dry, day 3: very dry); c) Forest vs vineyard distinct radiometric signature (H pol, V pol, AFT~ 38 deg angle).

b)



d) Surface parameter retrievals from CAROLS 2009 data

2-P retrievals (SM , τ_{NAD})	Land use	H_R	Q_R	NR_H	NR_V	Retrieved SM [m^3m^{-3}]	Field SM [m^3m^{-3}]	Retrieved τ_{NAD}	STD Retrieved SM [m^3m^{-3}]	RMSE (TB)
Dry day (1)	Shrubs	0.3	0.2	2	-1	0.15 (0.02)	0.11 (0.05)	0.30 (0.06)	0.003	1.3
	Vines	0.3	0.2	2	-1	0.11 (0.03)		0.23 (0.06)	0.002	1.7
	Open Forest	0.3	0.2	2	-1	0.20 (0.08)	-	0.34 (0.13)	0.045	2.0
Very dry day (3)	Shrubs	0.3	0.2	2	-1	0.03 (0.05)	0.06 (0.03)	0.13 (0.20)	0.002	2.1
	Vines	0.3	0.2	2	-1	0.04 (0.05)		0.22 (0.24)	0.002	1.3
	Open Forest	0.3	0.2	2	-1	0.06 (0.06)	-	0.24 (0.22)	0.003	2.3

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