INSTITUTO DE INGENIERÍA UNAM

IPN

TITLE:

Soil moisture field measurements in a Mexican riverine ecosystem to validate L4SM-SMAP products

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UNAM: National Autonomous University of Mexico; IPN: National Polytechnic Institute; ESIME: High School of Mechanical and Electrical Engineering

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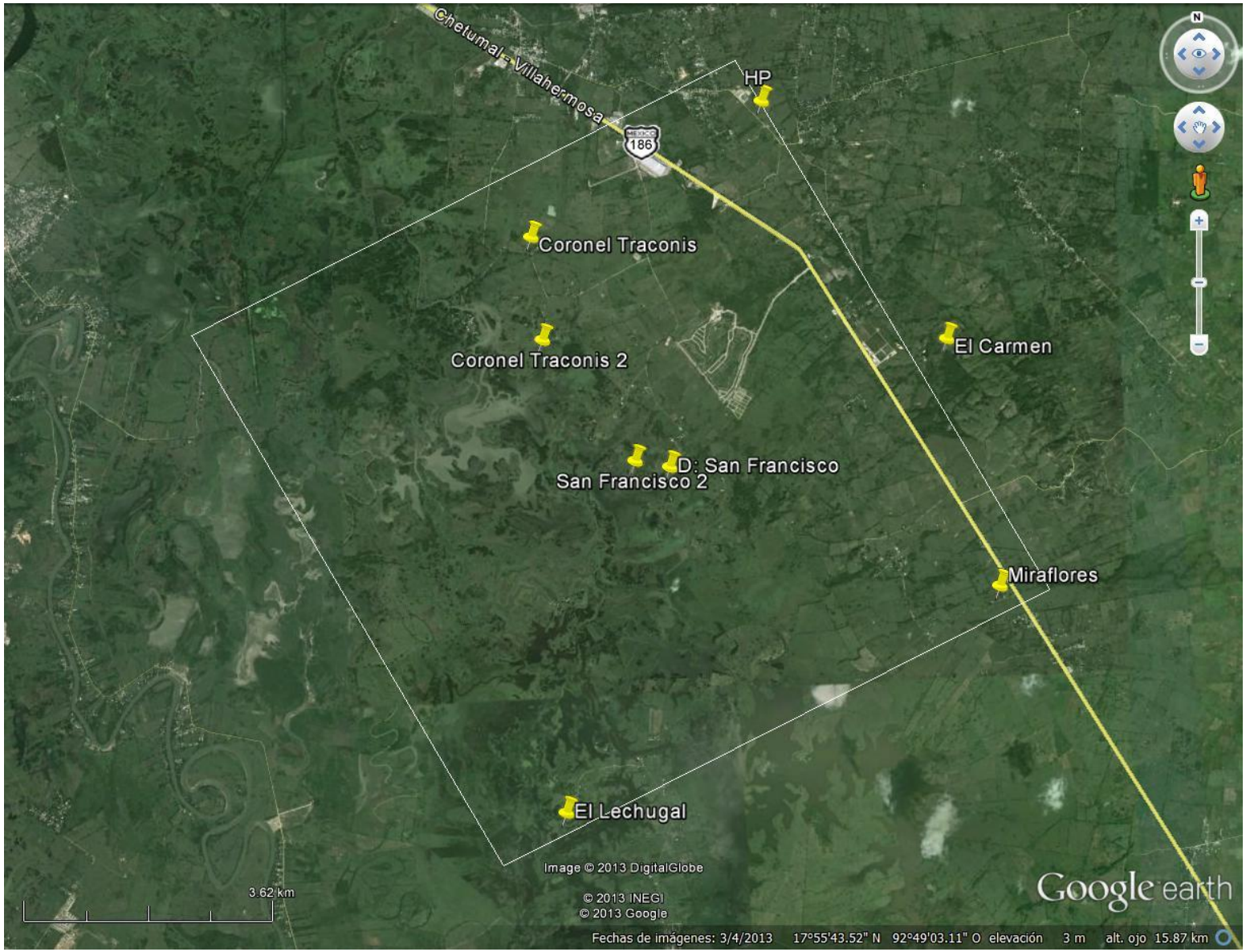
9 km CELL



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CVS Name/No.	Point ID
Zapotes/32	001

Station name	Station Number	Established	Latitude (N)	Longitude (W)	Elevation (m)
San Francisco	T2, 02	September2012	17°55'40"	92°48'43"	11
San Francisco 2	01	September2012	17°55'44"	92°48'60"	5
Miraflores	03	September2012	17°54'35"	92°46'01"	18
HP	04	September2012	17°58'35"	92°47'45"	28
Coronel Traconis 2	05	September2012	17°56'44"	92°49'74"	8
Coronel Traconis	06	September2012	17°57'34"	92°49'45"	5
El Carmen	07	September2012	17°56'34"	92°46'19"	42
El Lechugal	08	September2012	17°52'59"	92°49'43"	8
El Dorado 02	09	September2012	17°51'36"	92°050'15"	10

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Approach to calibration

	FRD (Diviner)		TDR (CS616)
	Gravimetric 2012	**Gravimetric 2013**	
Default Calibration Equation	$SF = (F_A - F_S)(F_A - F_W)^{-1}$ $SF = A*(Hv^B)+C$; A= 0.2746, B= 0.3314, C= 0.0		VWC = -0.0663 - 0.0063*period + 0.0007*period2 .
San Francisco			Gravimetric 2012 Hvt=(0.0243*TDR)+0.3389 Gravimetric 2013 Hvt= (0.1554*TDR)+ 0.2406
San Francisco 2	Hvg = 0.0048 * (Diviner) + 0.761, R^2 = 0.09	Hvg = 0.1802 * (Diviner) + 27.0284, R^2 = 0.02	
	Hv_{10-60}= 0.4474*(Diviner$^{1.096}$), R^2=0.69 Hv_{70-150}= 21.277*(Diviner$^{0.0389}$), R^2=0.06	Hv_{10-60}= 1.1706*(Diviner) - 10.77, R^2=0.57. Hv_{70-150}= 16.881*(Diviner$^{0.2147}$), R^2=0.16	
Miraflores	Hv = 0.5898*(Diviner)$^{0.9278,}$ R^2 = 0.55	Hv = -0.1466*(Diviner) + 25.044, R^2 = 0.15	
	Hv_{10-50}= -1.2152*(Diviner) + 45.091, R^2=0.69. Hv_{60-130}= 0.866*(Diviner$^{0.7737}$), R^2=0.59	Hv_{10-60} = 292.62 * (Diviner$^{-0.739}$), R^2 = 0.85. Hv_{70-130}= 93.587 * (Diviner$^{-0.51}$), R^2 = 0.54	
PH	Hvg = 8.602 * (Diviner) $^{0.2703}$, R^2 = 0.62	Hv = 14.755 * (Diviner) $^{0.1763}$, R^2 = 0.10	
	Hv_{10-30}= 3.4685*(Diviner$^{0.596}$), R^2=0.83. Hv_{40-140}= 7.7843*(Diviner$^{0.2977}$), R^2=0.57	Hv_{10-50} = 12.76 * (Diviner$^{0.208}$), R^2=0.47 Hv_{60-140}= -0.655 * (Diviner) + 48.888, R^2=0.42	
El Lechugal	Hv = 13.9 * (Diviner)$^{0.1618}$, R^2 = 0.53	Hv = 19.144 * (Diviner$^{0.1329}$), R^2 = 0.30	
	Hv_{10-50}= 0.5855*(Diviner) + 14.129, R^2=0.83. Hv_{60-160}= -0.0838*(Diviner) + 24.847, R^2=0.08	Hv_{10-50} = 0.6429*(Diviner) + 19.222, R^2=0.47 Hv_{60-160}= -0.3047 *(Diviner) + 35.527, R^2=0.2	
El Dorado 2	Hv= 27.338 * (Diviner) $^{-0.041}$, R^2 = 0.001	Hv= 0.4497 * (Diviner) + 22.629, R^2 = 0.1	
	Hv_{10-50}= 0.9242 * (Diviner)+4.1334, R^2=0.09. $Hv6_{0-70}$= 26.824*(Diviner$^{-0.0564}$), R^2=1	Hv_{10-50}= 0.9119 * (Diviner) + 7.311, R^2=0.36. Hv_{60-70}= 0.1681*(Diviner) + 29.148, R^2= 1	
El Carmen	Hv = 0.2032 * (Diviner) + 22.746, R^2 = 0.09	Hv = 60.587 * (Diviner$^{-0.109}$), R^2 = 0.08	
	Hv_{10-40}= 68.645 * (Diviner$^{-0.305}$), R^2=0.99. Hv_{50-130}= 7.2453 *(Diviner$^{-0.4075}$), R^2=0.25	Hv_{10-40}= 181.23 *(Diviner$^{-0.463}$), R^2=0.82. Hv_{50-130}=78.938 * (Diviner$^{-0.175}$), R^2=0.31	
Coronel Traconis	Hv = 14.959 * (Diviner$^{0.0826}$), R^2 = 0.09	Hv = 22.78 * (Diviner$^{0.0756}$), R^2 = 0.20	
	Hv_{10-80} = 6.1279 * (Diviner$^{0.4588}$), R^2 = 0.75. Hv_{90-120}= 12.812 * (Diviner $^{0.1007}$), R^2 = 0.39	Hv_{10-60} = 16.774 * (Diviner$^{0.2196}$), R^2 = 0.77. Hv_{70-120}= 20.504* (Diviner$^{0.0939}$), R^2 = 0.60	
Coronel Traconis 2	Hv = 1.1862 * (Diviner) – 2.4386, R^2 = 0.26	Hv = 7.2143 * (Diviner)$^{0.4618}$, R^2 = 0.13	
	Hv_{10-50} = 4.8695*(Diviner$^{0.4835}$), R^2=0.34 Hv_{60-120}= 2.3307*(Diviner$^{0.797}$), R^2=0.69	Hv_{10-40} = 0.518 * (Diviner) + 16.524, R^2 = 0.69. Hv_{50-120}= 61.153 * (Diviner$^{-0.165}$), R^2 = 0.01	

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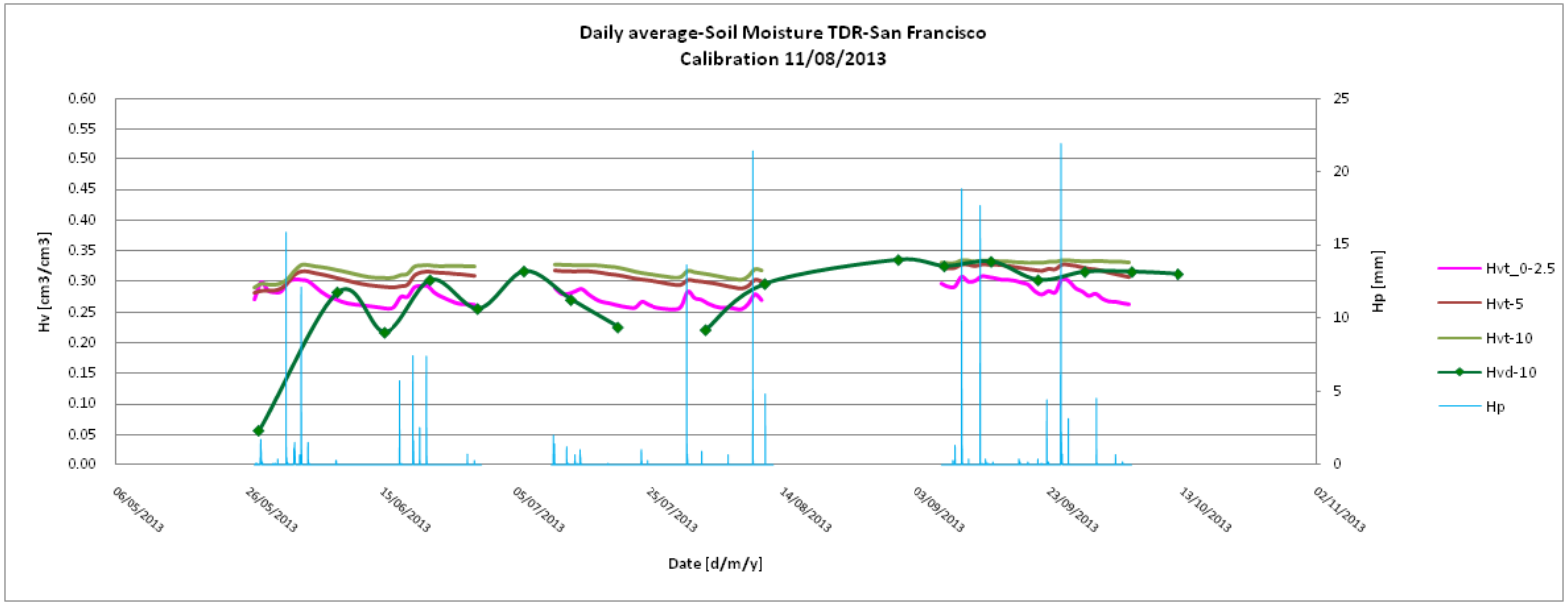
Approach to representing the SMAP product (0-5 cm)



Up-scaling. No yet.

At the moment we are analyzing the best spatial statistical technique to represent our data

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Ground-based field campaigns

Satisfying 9 and 3 km; already working 2 domains of 9 km

Sampling methodology:
0 – 2.5 cm, 0 – 5 cm, 10, 20 and 30 cm gravimetric

How many points:
9 km Cell 1: 9 sites
9 km Cell 2: 8 sites

How long would it take?
4 hours

Duration
TRD 20 min, FDR a week
(budget for two years authorized)

Measurement Type	Method	Depths
Soil moisture	Gravimetric	2.5, 5, 10, 20 … - max depth
Soil moisture	FDR	10, 20 … - max depth
Soil moisture	TDR, wireless	0-2.5,5,10,20,30
Soil temperature	probes	0-2.5,5,10,20,30
Soil, and Vegetation	Texture, roughness, geometry, VWC	
Climatic variables	P, Ta, RH	

Opportunity to characterize VWC
Yes, already vegetation geometry and VWC were measured

Pre-Post launch?
Value now