

3.3 「Web を活用した地すべり 自動モニタリングシステム」

水文地質防災研究所パドヴァ支部研究員

ジャンルーカ・マルカート

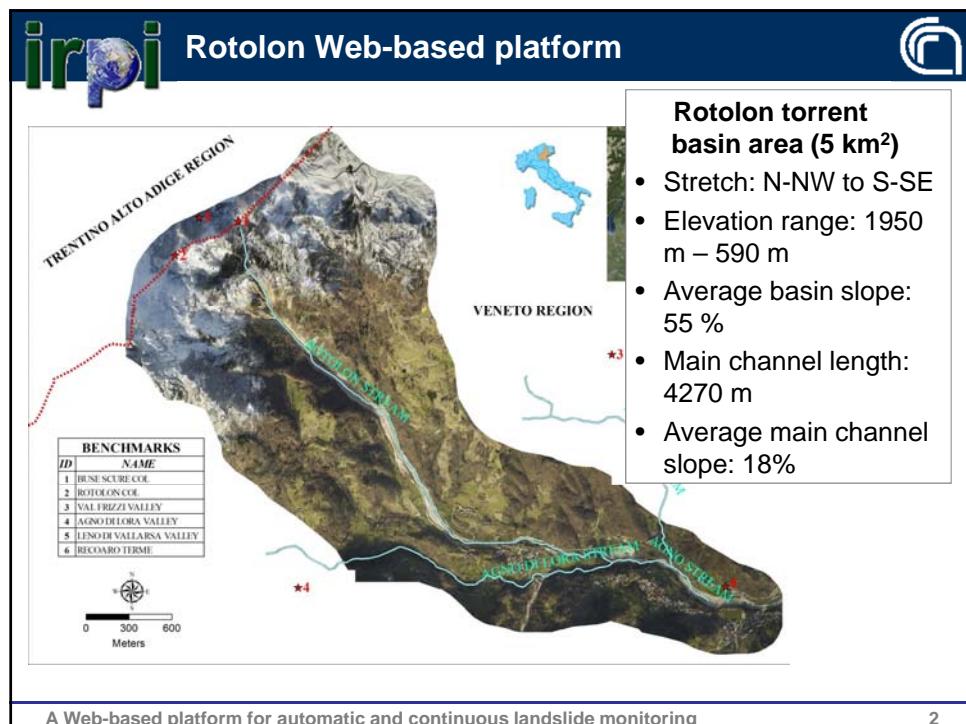


National Research Council of Italy



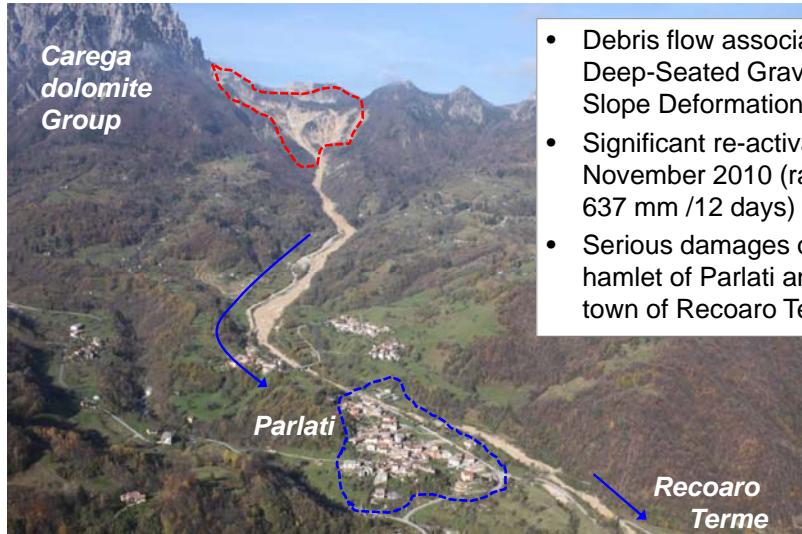
Istituto di Ricerca
per la
Protezione
Idrogeologica

A Web-based platform for automatic and continuous landslide monitoring: the Rotolon case study





Col Rotolon - Recoaro Terme, Vicenza (Eastern Italian Alps)



- Debris flow associated to a Deep-Seated Gravitational Slope Deformation
- Significant re-activation on November 2010 (rainfall of 637 mm /12 days)
- Serious damages on the hamlet of Parlati and the town of Recoaro Terme

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Col Rotolon - Recoaro Terme, Vicenza (Eastern Italian Alps)



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Monitoring System and implementation of an EWS

- **2 rain gauges**
- 1 video camera
- 6 wire extensometers
- Automated Total Station (ATS) with 42 benchmarks
- 3 pendulum section
- 1 trip wire
- Sirens system and thresholds
- Master Station
- Modem ADSL and WiFi
- Radio link

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Monitoraggio Frana del Rotolon
Reccaro Terme (VI)

Comitato di gestione per il monitoraggio della frana del Rotolon
Comitato delegato per il monitoraggio della frana del Rotolon dal 11 Ottobre al 2 Novembre 2010

Vista Generale | Monitoraggio | Primi GPR | CUM | CUM + EST

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Rotolon Web-based platform



Why a Web-based platform for disaster management?

- Collecting data, connecting users and sharing information
- Reduce cost of maintenance and simplify the monitoring network
- Aggregate all monitoring system measures on a common DBMS
- Provide a cost-benefit solution for stakeholders actions

Features and rules of a Web-based platform:

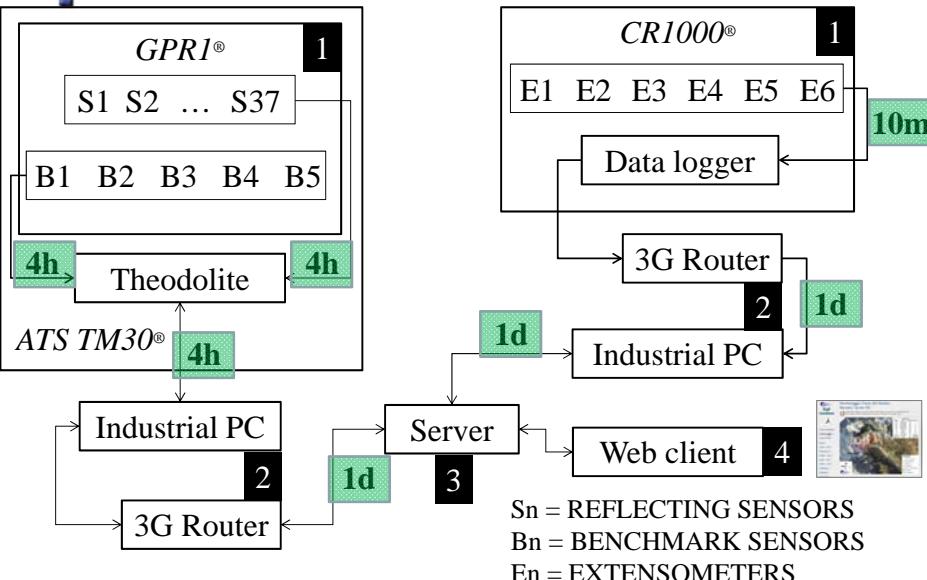
- Multi-user access and maintenance (admin rights)
- End-user support on prevention and decision-making (read-only rights)
- Common platform for a user-friendly interface (report and graphic layout)
- Integration and time-based synchronization of all measurements
- Near-real time and easy-to-use facility
- Automatic communication (Skype, email, SMS) by threshold criteria
- Apple SDK integration
- Remote user-interface for technical maintenance

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**Monitoraggio Frana del Rotolon
Recoaro Terme (Vicenza)**

Commissariato delegato per il superamento dell'emergenza derivante da eventi alluvionali che hanno colpito il territorio della Regione Veneto dal 31 Ottobre al 2 Novembre 2010

READ-ONLY RIGHTS

RefName	TYPE	ALTIITUDE_M	LENGTH_M
EST10	ESTENSIMETRO	1310	5
EST11	ESTENSIMETRO	1320	8
EST12	ESTENSIMETRO	1330	5
EST16	ESTENSIMETRO	1300	15
EST7	ESTENSIMETRO	1300	18
EST8	ESTENSIMETRO	1300	10
S1	PENDOLO	1330	84
S2	PENDOLO	855	59
S3	PENDOLO	790	39
S4	CAVO A STRAPPO	1300	33
CONTROLLO1	TELEMETRIA	245	-
CONTROLLO2	MASTER	3380	-

LEGENDA

- ★ CONTROLLO
- CAVO A STRAPPO
- ESTENSIMETRO
- PENDOLO
- BENCHMARK
- ▲ PUNTO DI CONTROLLO
- STAZIONE
- PLUVIOMETRO

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CUM = cumulated rainfall
EST = extensometer
TEMP = temperature
RAD = solar radiance
PREC = hourly average rainfall

ADMIN RIGHTS

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Vista Generale | Monitoraggio | Prismi GPR | Arrow Map | Spostamento 3D | CUM | CUM + EST | Riferimenti | TEMP + EST | RAD + EST | PREC + EST | Hillshade | Webcam | Vista 3D | Documenti |

SCALA 1:10000
0 150 300 600 Meters

MONITORAGGIO

ID Name	Type	Altitude_m	Length_m
E110	ESTENSIMETRO	1330	1
E112	ESTENSIMETRO	1330	5
E113	ESTENSIMETRO	1330	10
E117	ESTENSIMETRO	1330	18
E118	ESTENSIMETRO	1600	10
11	PENDOLO	1330	14
32	PENDOLO	855	59
33	CAVO A STRAPPO	795	39
54	CAV. A STRAPPO	745	33
CONTROLLI	TELECAMERA	745	300
MASTER	MASTER	3000	300

LEGENDA

- ★ CONTROLLO
- CAVO A STRAPPO
- ESTENSIMETRO
- PENDOLO
- BENCHMARK
- ▲ PUNTO DI CONTROLLO
- STAZIONE
- PLUVIOMETRO

Prisma 16
Prisma 17
Prisma 18
Prisma 19
Prisma 20

per accedere ai dati monitorati oppure a tendina sottostante

Selezionare il prisma

Selezionare l'estensimetro

Analisi pioggia

Pluviometro sotto cima Postal:

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Monitoring / reflecting sensors

Dato misurato dal sensore nr. 7

(nessuna correzione applicata, aggiornato al 2012-11-19 08:00:00 con ultima misura utile per il sensore al 2012-11-19 08:00:00)

Spostamento (mm)

— Prisma 7

13Nov 14Nov 15Nov 16Nov 17Nov 18Nov 19Nov

KML layer
[] Ortofoto
[] Fotografie

• API selector

• Range selector

DSC00967.JPG

Main

Google

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Monitoring / extensometer

Dato misurato dall'estensimetro nr. 8

(Media oraria con aree di confidenza ottenute dallo scostamento massimo rispetto al valore medio, aggiornata all'ultima misura utile per l'estensimetro al 2012-11-19 08:25:00)

Spostamento (mm)

• Range selector

Linear fit

Clicca il pulsante "Mostra fit lineare" per generare una regressione lineare sui dati rappresentati. Se cambi lo zoom e schiacci nuovamente il pulsante, la regressione lineare verrà ricalcolata sui punti visibili.

Mostra fit lineare Elimina fit

Velocità: 2.481 [mm/gg]

Aerial view images: DSC00967.JPG and Google Earth view showing a landslide area with a red polygon and a green line.

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Monitoring / rain gauge

Precipitazione totale pluviometro sotto cima Posto degli ultimi 10 giorni: 137.6 mm.

Periodo

Da: Nov 2012 Graffa

Lu	Ma	Me	Gi	Ve	Sa	Do
1	2	3	4			
5	6	7	8	9		
12	13	14	15	16		
19	20	21	22	23	24	25
26	27	28	29	30		

• Range period

Precipitazione totale (mm) — Precipitazione oraria (mm)

H₂O oraria (mm)

• Rainfall cumulated Alert level

Precipitazione totale pluviometro sotto cima Posto degli ultimi 10 giorni: 232.9 mm.

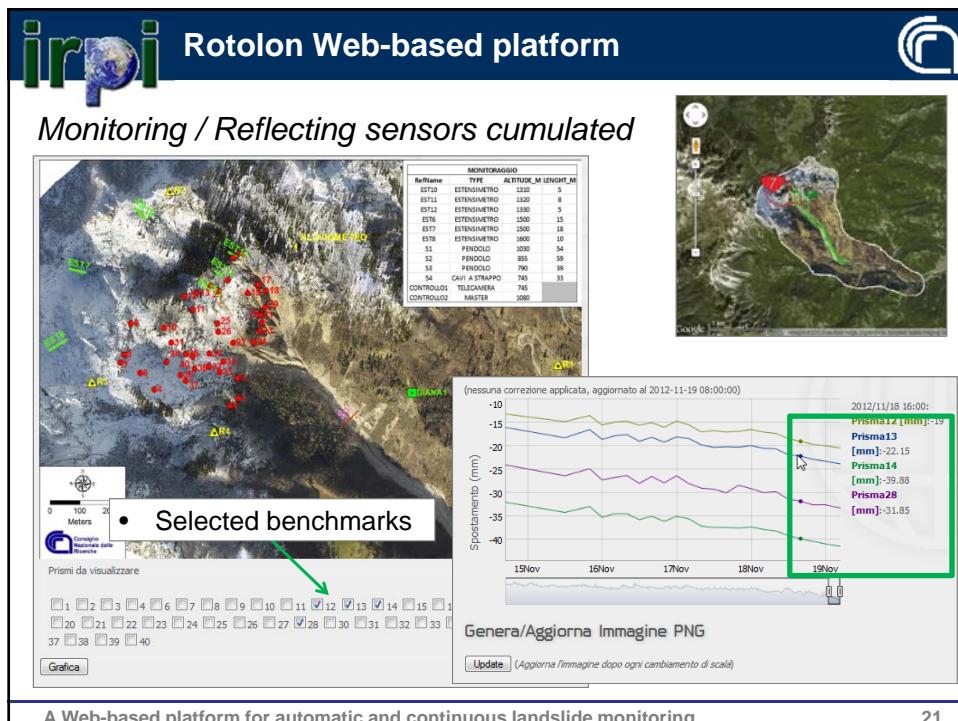
Precipitazione totale pluviometro sotto cima Posto degli ultimi 10 giorni: 285.2 mm.

Attenzione: sono stati superati i 300 mm di pioggia in 10 gg.

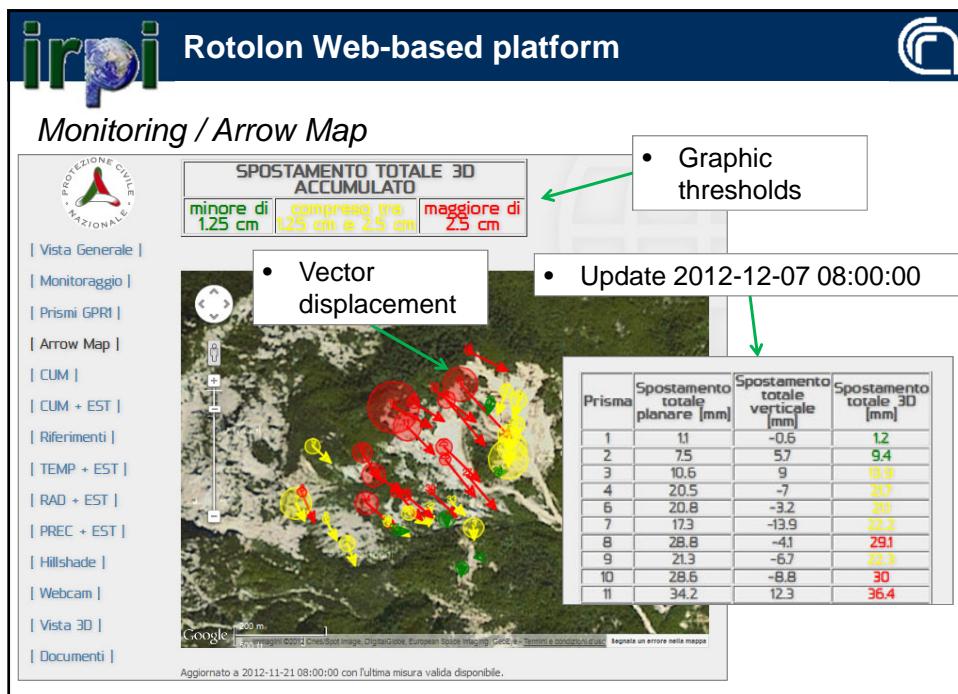
OK

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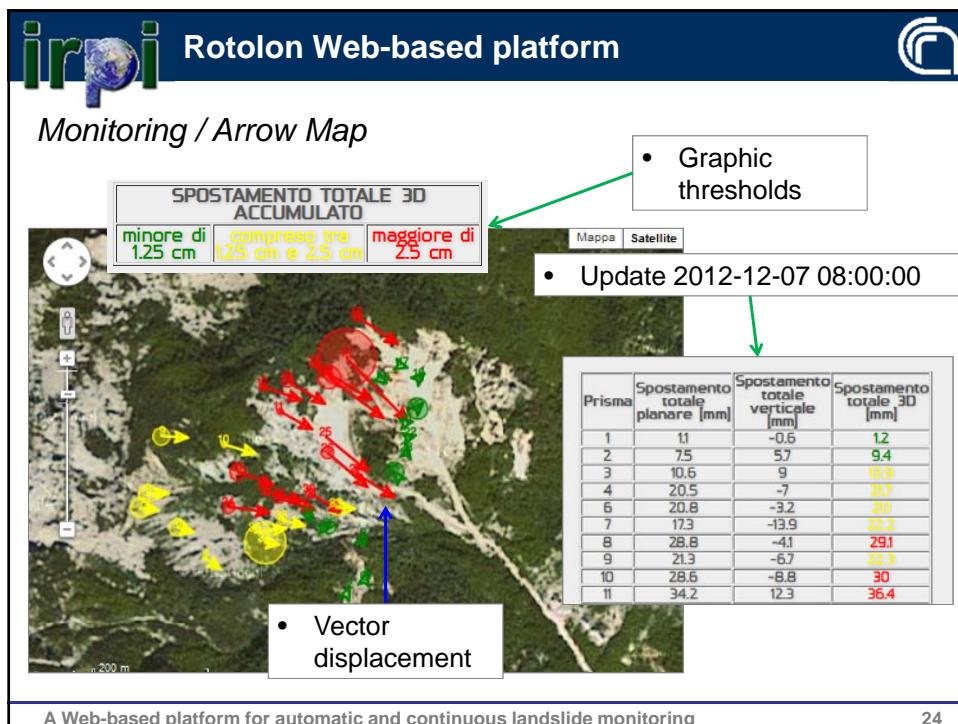
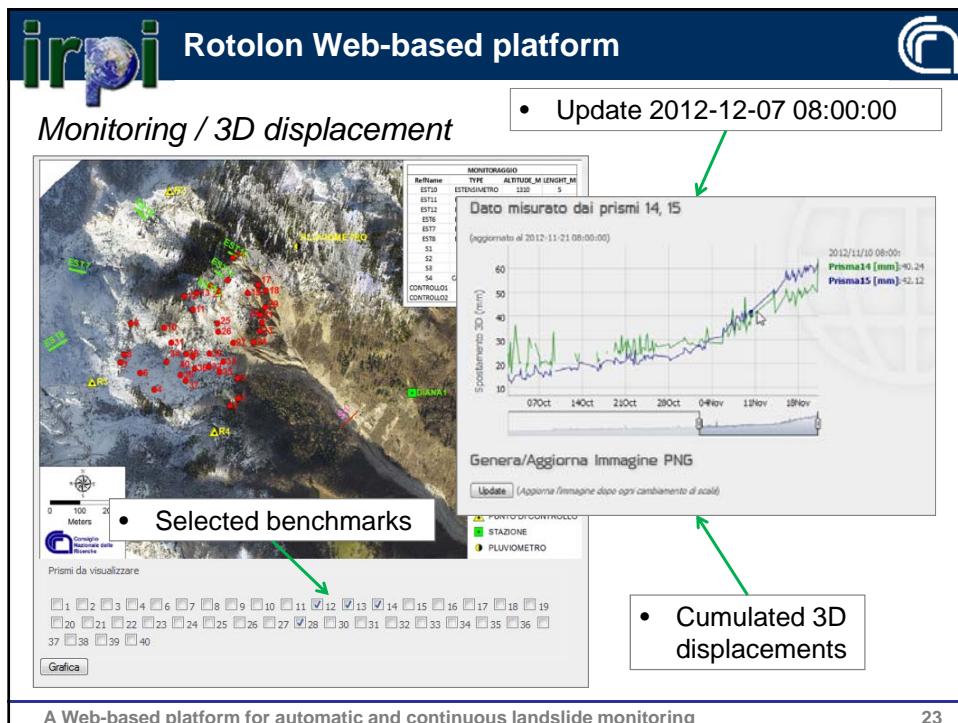
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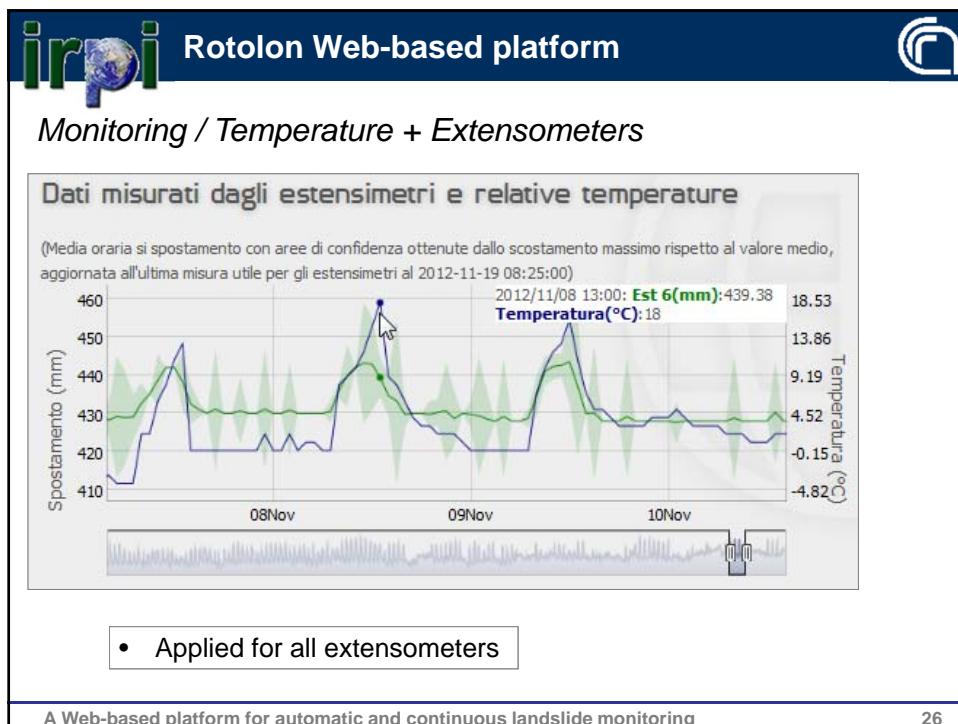
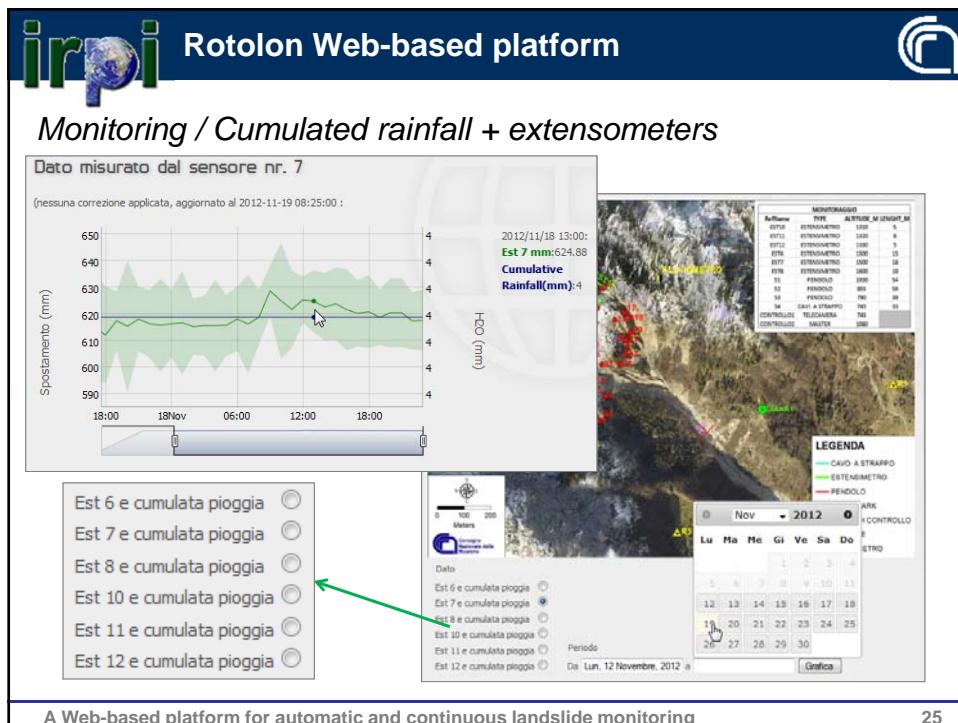


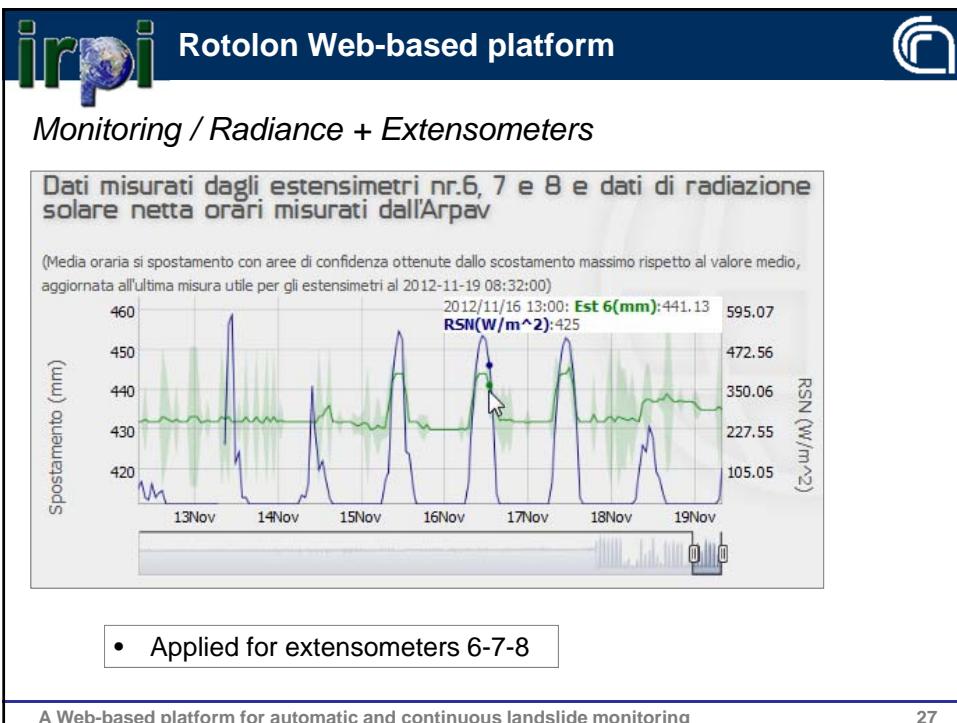
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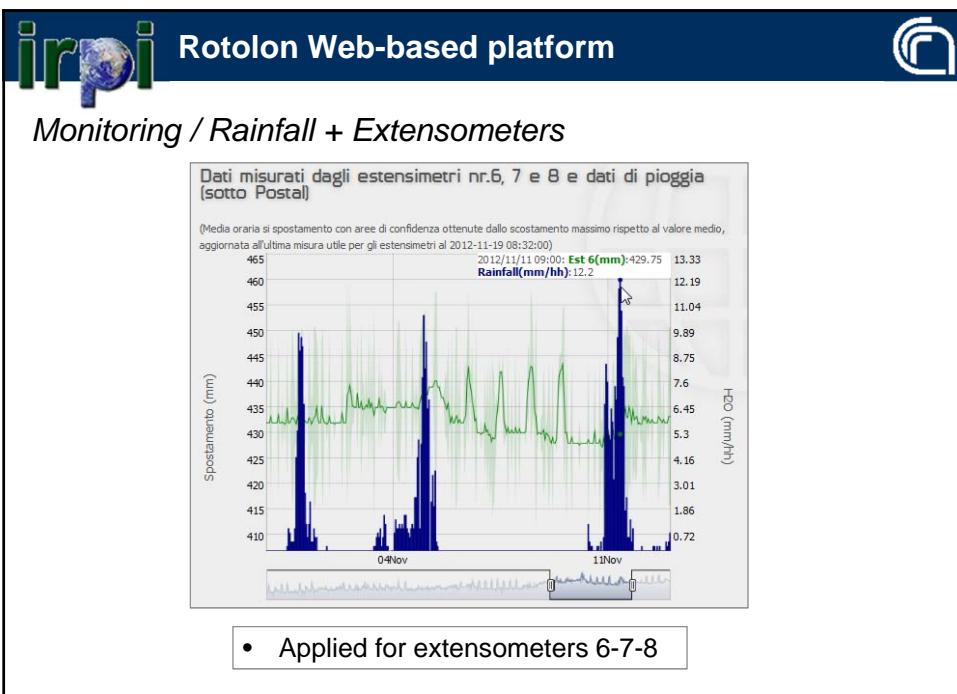






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