



Wildfire-induced geohydrological hazards in the Alps: the need for a systematic documentation procedure

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Session: 5.4 - WILDFIRE, EROSION AND LANDSLIDE IN THE FRAMEWORK OF GLOBAL WARMING:
CIVIL PROTECTION AND LAND MANAGEMENT AIMED AT MITIGATION OF EFFECTS ON SLOPES
INDUCED BY EXTREME EVENTS

Wednesday 15, November 2023, Firenze, Italy

1. Introduction

Motivation

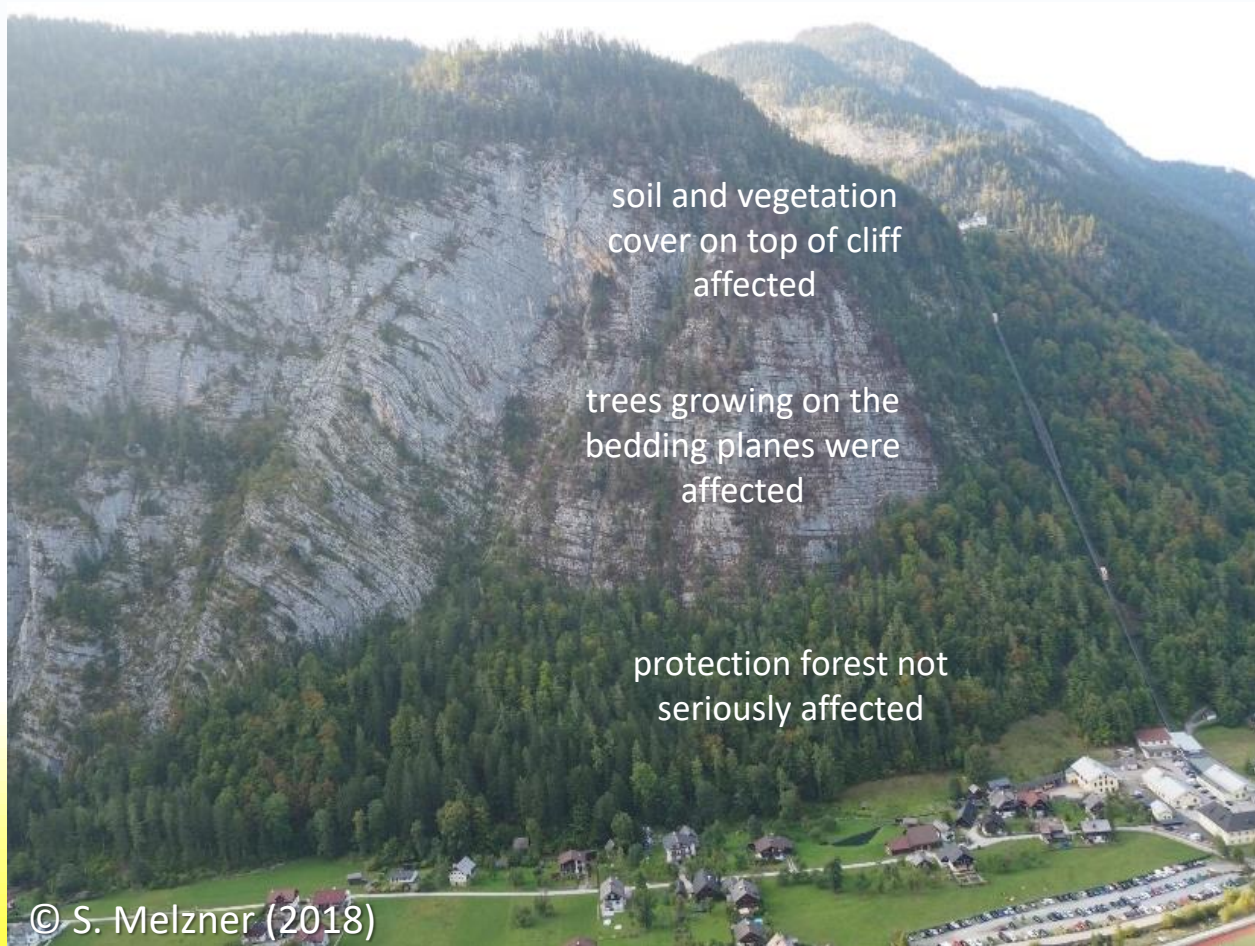
2018, August 21.- 25.: Forest fire in the Echern Valley, community Hallstatt (Austria)



1. Introduction

Motivation

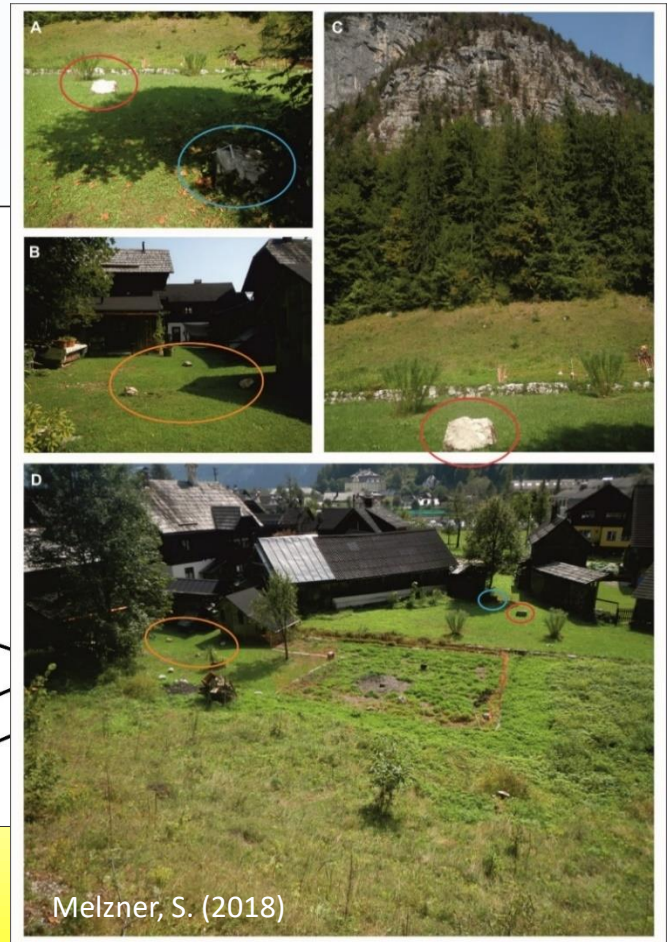
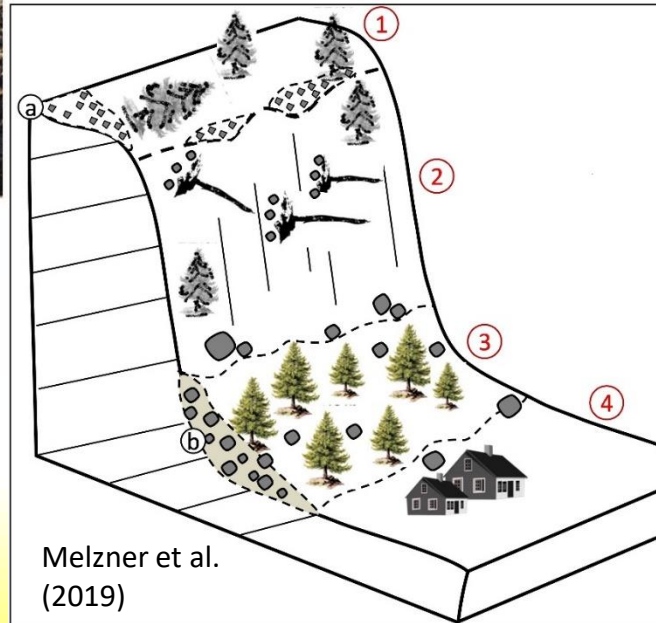
2018, August 28. & 29.: mapping of post- wildfire risk → formed the basis for the planning of preventive measures (duration of evacuation of houses, etc.)



1. Introduction

Motivation

Mapping results: Rockfalls occurred during the fire, boulders $< 0,5\text{m}^3$ reached the houses; potential for future rockfalls and debris flows



2. Expertise in the Alps

Forest fire databases



2. Expertise in the Alps

Example: Regione Autonoma Friuli Venezia Giulia (Italy)

← → ↻ eaglefvg.regione.fvg.it/eagle/main.aspx?configuration=guest

YouTube Maps Gmail Posteingang (1.809)... Anmelden - Zoom easynome Webmail... Antwo

REGIONE AUTONOMA FRIULI VENEZIA GIULIA

incendi

Risultati



- Perimetro degli incendi boschivi - DATASET**
 - 1. Digitalizzazione cartografie allegate ai Fogli notizie incendi boschi redatti dalle Stazioni Forestali con rilievi GPS sul campo
- Punto inizio incendio - DATASET**
 - 2. Punti inizio incendi boschivi stimati o rilevati dalle Stazioni Forestali con rilievi GPS sul campo
- Superficie boscata bruciata - DATASET**
 - 3. Viene rilevato con strumentazione GPS dalle Stazioni Forestali Regionali, oppure con editing grafico utilizzando l'ortofoto.
- Carta della pericolosità - DATASET**
 - 4. Definisce geograficamente le zone di pericolosità riportate sul Piano antincendio regionale per il periodo 1997-1999 (l'ultimo emesso)
- Ricognizione territori percorsi dal fuoco - DATASET**
 - 5. Ricognizione territori percorsi dal fuoco

RDN2008 Lng 12.582092° Lat 46.560749°



Eagle.fvg

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REGIONE AUTONOMA
FRIULI VENEZIA GIULIA



Operazioni di spegnimento
degli incendi boschivi
in ambiente carsico

Lucio Ulian Alessandra Tribuson

2. Expertise in the Alps

Little data/publications on fire- induced geohydrological processes

Two cooperations on this topic:

2019: invitation by the Geological Survey of Israel for a one month research visit to Israel to cooperate with wildfire experts from University of Haifa

Melzner et al. (2019): Post-wildfire rockfall risk in the eastern Alps

2022: cooperation with WSL in Switzerland

Melzner et al. (2022) & (2023): Post wildfire risk in the Swiss mountain areas (in German)

Nat. Hazards Earth Syst. Sci., 19, 2879–2885, 2019
<https://doi.org/10.5194/nhess-19-2879-2019>
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Natural Hazards
and Earth System
Sciences



Brief communication: Post-wildfire rockfall risk in the eastern Alps

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SANDRA MELZNER, MARCO CONEDERA, GIANNI BORIS PEZZATTI

Post Waldbrand Risiko in den schweizerischen Gebirgen
Post wildfire risk in the Swiss mountain areas

Zusammenfassung:
Im Gebirge gehören Waldbrände zu den bedeutendsten Naturereignissen. Neben der Veränderung des Waldbestands bzw. der Beeinträchtigung der Schutzwaldfunktion haben hohe Feuertemperaturen auch erhebliche physikalische und chemische Auswirkungen auf den Boden und Fels. Dies bedingt eine erhöhte Disposition gegenüber dem Auftreten geohydrologischer Prozesse wie Steinschläge, Felsstürze, Murgänge, Hangmuren und Erdbeben, die Infrastrukturen und Siedlungen gefährden können. In der Schweiz sind in der Waldbranddatenbank Swissfire umfangreiche waldbezogene Daten zu über 10.000 Waldbrandereignissen gespeichert. Damit bildet die Datenbank ein wichtiges Instrument, nicht nur um die Entwicklung und Veränderungen in den Feuerregimen in unterschiedlichen Gebieten erkennen zu können, sondern auch um Hinweise auf das Potential geohydrologischer Gefahren und Risiken nach Feuer zu geben und entsprechende technische und waldbauliche Maßnahmen planen und umsetzen zu können.

Abstract:
In mountain areas, wildfires are among the most important natural disturbances. In addition to the disruption of the vegetation cover or the impairment of the protective forest function, the high temperatures also have considerable physical and chemical effects on the soil and rockmass structure. This results in an increased susceptibility to geohydrological processes such as landslides, rockfalls and debris flows, which can endanger infrastructures and settlements. The Swiss forest fire database Swissfire contains extensive forest-related data on more than 10,000 fire events. The database is thus an important tool not only for identifying the development and changes in fire regimes in different areas, but also for providing information on the potential of geohydrological hazards and risks after fires and for planning and implementing appropriate technical and silvicultural measures.

Stichwörter:
Waldbrand, Schutzwald, Swissfire, geohydrologische Gefahren, Rutschung, Steinschlag, Hangmure, Murgang

Keywords:
Wildfire, protective forest, Swissfire, geohydrological hazards, landslide, rockfall, hillside debris flow, debris flow

2. Expertise in the Alps

Little data/publications on fire- induced geohydrological processes

Crystalline rocks (Switzerland)



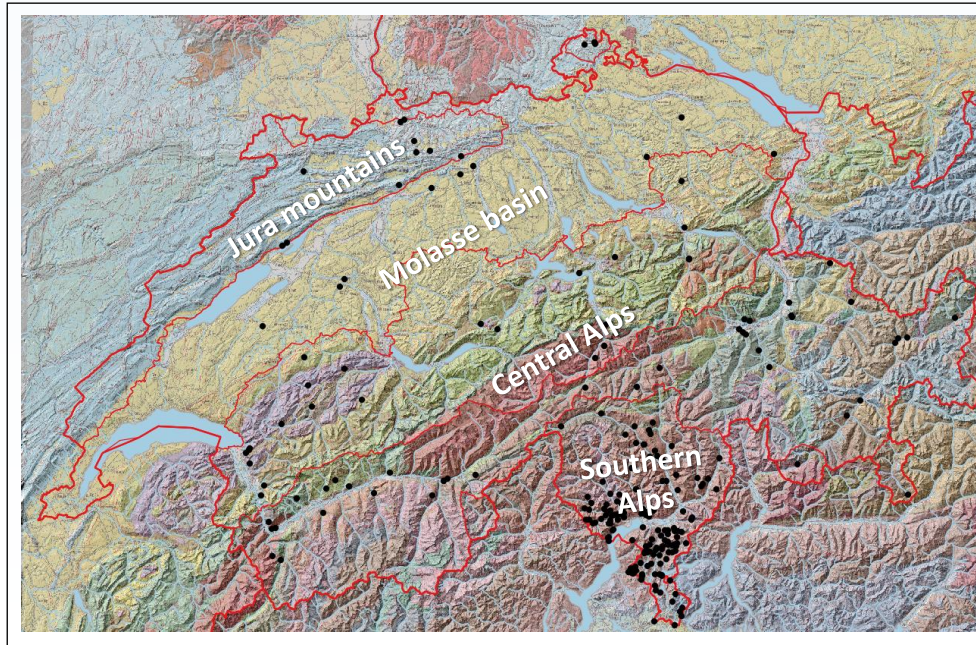
Carbonatic rocks (Austria)



Melzner et al. (in prep.)

2. Expertise in the Alps

Post wildfire risk in the Swiss mountains

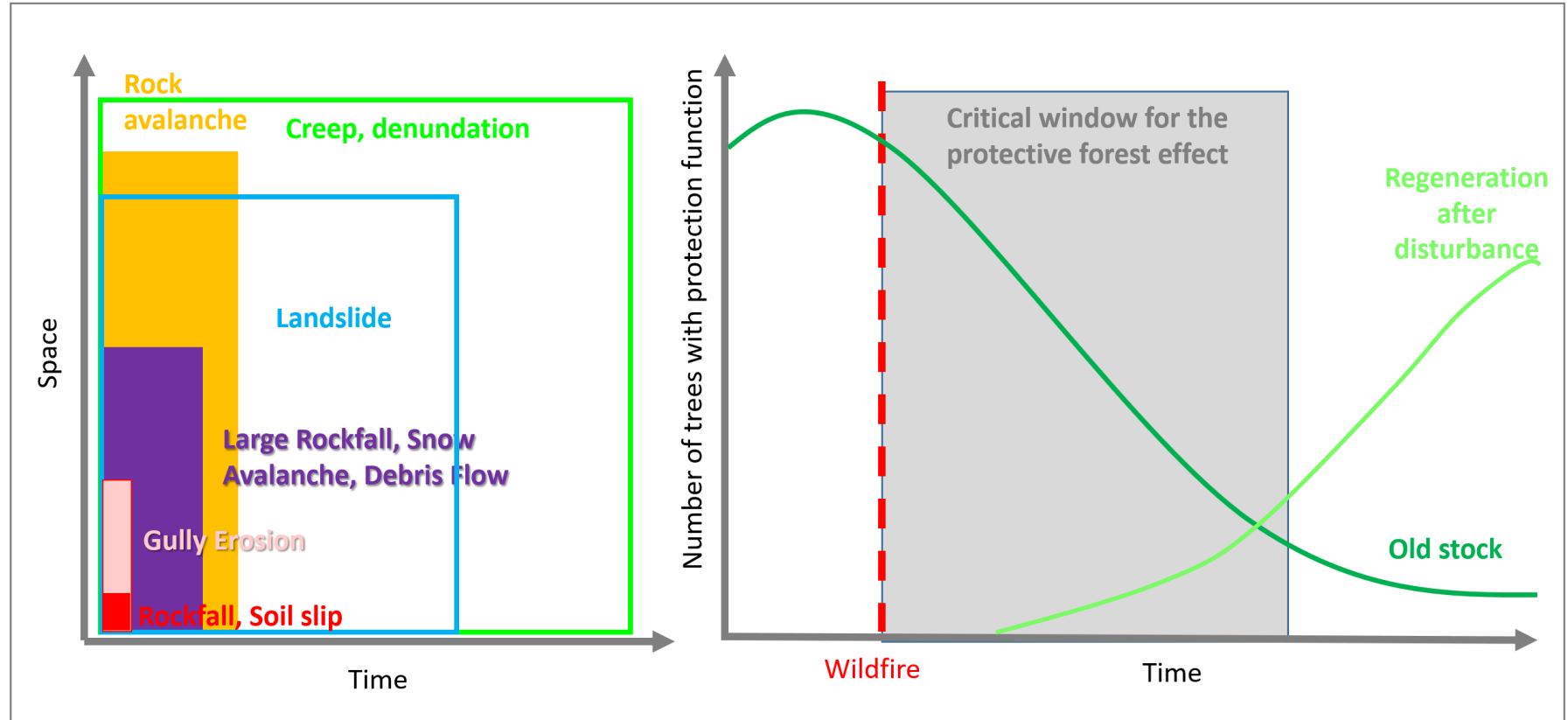


Melzner et al. (2023): Post wildfire risk in the Swiss mountains.



2. Expertise in the Alps

Post wildfire risk in the Swiss mountains



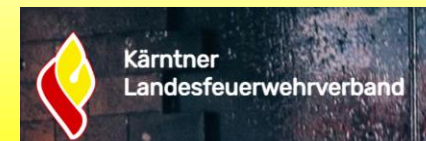
Melzner et al. (2023): Post wildfire risk in the Swiss mountains.

3. Alpine Network

1° Alpine Workshop on fire- induced geohydrological hazards in mountainous areas, October 11°-12°, 2022 in Klagenfurt (Austria)



experts from 5 countries
and 12 different organisations



3. Alpine Network

1° Alpine Workshop on fire- induced geohydrological hazards in mountainous areas, October 11°-12°, 2022 in Klagenfurt (Austria)

- + experts from different disciplines (geology, forestry, natural hazards and disaster prevention)
- + 12 presentations and one field trip to the forest fire in Trieste & Slovenia in summer 2022
- + expert meeting was held in 3 languages (English, German and Italian)

→ Summary of the expert meeting: www.geochange-consulting.com



4. Outlook



Geohydrological hazards:

- Modern fire management activities should consider the systematic documentation of geohydrological processes before, during and after a wildfire event,
 - integrating them into the national fire databases.
- a practical need to verify/understand and possibly quantify the impacts of wildfires to rock and soil surface
 - improve the capability to predict fire-induced geohydrological processes and the associated hazard and risk levels. .

Network of interdisciplinary experts:

- The Alpine Region: the political, administrative, cultural, and linguistic conditions are very heterogeneous → making the organization of common institutional activities, the sharing of information and databases, and the networking particularly difficult.
- It is planned that these interdisciplinary expert meetings will take place every 2 years in a different country and that the speakers/countries will always change, so that the network of experts is constantly expanding.

4. Outlook

Report forest fires	
General information:	
Who and what Surveyor/ report by: _____ Telephone number: _____ Firetype: _____ When: Date of first fire alarm: _____ Date of fire extinguished: _____ <input type="checkbox"/> Provision of the Forest Service	Brandnummer _____ <div style="text-align: center; font-size: small;"> (See legend) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec </div> Contact (example): GEOCHANGE Consulting Fichtenbergstrasse 4/4, 9020 Klagenfurt geoechange-consulting.com, +43 680 3057865 Where: District: _____ Community 1: _____ Community 2: _____ Community 3: _____ Community 4: _____ Name: _____
Event description forest fire:	
Fire outbreak point Coordinates: _____ Net: _____ Accuracy: _____ Heights: _____ Location: _____	Relief Slope: _____ % Exposition (medium): _____ <div style="text-align: center;"> W O S W O S </div>
Forest Type <input type="checkbox"/> Shrub forest <input type="checkbox"/> Pasture forest <input type="checkbox"/> Broadleaf forest <input type="checkbox"/> Coniferous forest ** <input type="checkbox"/> Mixed forest <input type="checkbox"/> Afforestation areas	Typ of open area <input type="checkbox"/> Meadows and pastures <input type="checkbox"/> Arable (farm) land <input type="checkbox"/> Broadfield and wasteland <input type="checkbox"/> Vineyards <input type="checkbox"/> Green spaces in urban centres <input type="checkbox"/> Gorse/hawthorn <input type="checkbox"/> Road and railway embankments <input type="checkbox"/> Landfills and pits <input type="checkbox"/> other

[illegible]

Bemerkungen (z.B. Fotonummern/ Aktenverweise etc.)	
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<div> <div>Ausfüllanleitung</div> <div> <div>Hinweise zum ankreuzen</div> <ul style="list-style-type: none"> • normalerweise: nur 1 Kästchen ankreuzen, wenn Auswahl horizontal dargestellt ist • normalerweise: mehrere Kästchen sind möglich, wenn Auswahl vertikal dargestellt ist • Ausnahmen: Exposition (1), Herschende Baumart (2), Ursache (1) </div> <div> <div>Detaillinformationen</div> <div> <div>Exposition: Kästchen in der Mitte bedeutet: Ebene Lage</div> <div>Brandgut: Lautsicht bezüglich Waldtyp (z.B. Nadel) bewerten</div> </div> </div> </div>	

Thank you very much!!!!



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Melzner, S., Conedera, M. & Pezzatti, B. (2023): Post Waldbrand Risiko in den Schweizerischen Gebirgen. Journal des Vereins der Diplomingenieure der Wildbach- und Lawinenverbauung. 86. Jahrgang, Jänner 2023, Heft Nr. 190, Salzburg, Österreich. https://www.geochange-consulting.com/wp-content/uploads/2023/08/Melzner_etal_2023-1.pdf

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