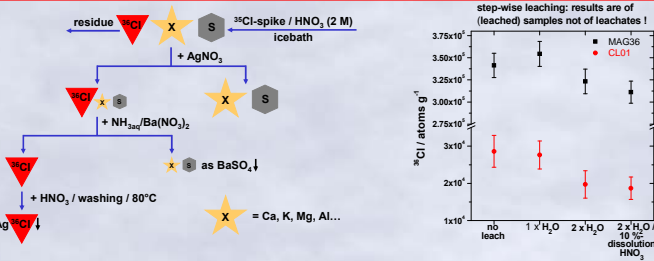


Introduction

- ▶ in-situ produced cosmogenic nuclides valuable tools for environmental and Earth sciences
- ▶ progress in accelerator mass spectrometry (AMS) >>> determination of radionuclide concentrations as low as 10^4 – 10^5 atoms/(g rock)
- ▶▶▶ quantifying Earth's surface processes
- ▶ accurate application of this method only possible, if production rates in certain environment over certain time period exactly known >>> but necessary data found in the literature differs a lot

Sample preparation

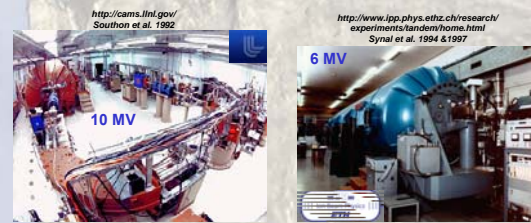
- ▶ for ^{36}Cl by AMS >>> chemical separation of ^{36}Cl out of dissolved sample needed
- ▶ applied chemistry is variation of Stone et al. (1996) with special care to remove atmospheric ^{36}Cl and prevent Cl losses before total equilibration
- ▶ ^{36}Cl -enriched spike >>> isotope dilution for Cl-nat determination



Aim of the study

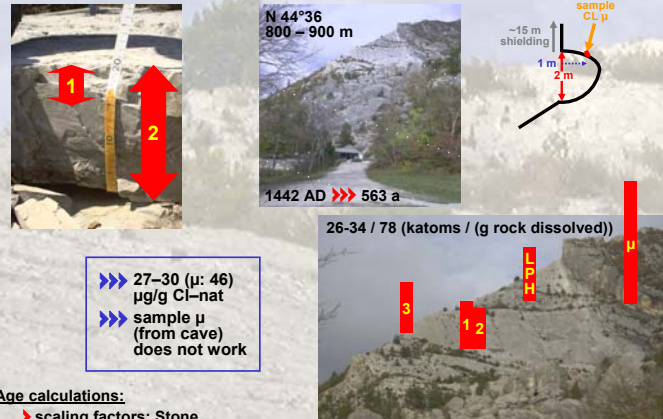
- ▶ one of European project "CRONUS-EU" goals: high quality calibration of ^{36}Cl production rate at independently dated surfaces
- ▶ our part: samples from two medieval landslide areas in the Southern French Alps
 - ▶ "Le Claps" (N 45°30', E 5°58', 800–900 m, V = $2 \times 10^6 \text{ m}^3$ (Couture et al. 1997), 1442 AD)
 - ▶ "Mont Granier" (N 44°36', E 5°27', 330–420 m, V = $500 \times 10^6 \text{ m}^3$ (Nicoud et al. 1998), 1248 AD)
- ▶ calcite rich samples from bedrock and big boulders

Accelerator mass spectrometry (AMS)



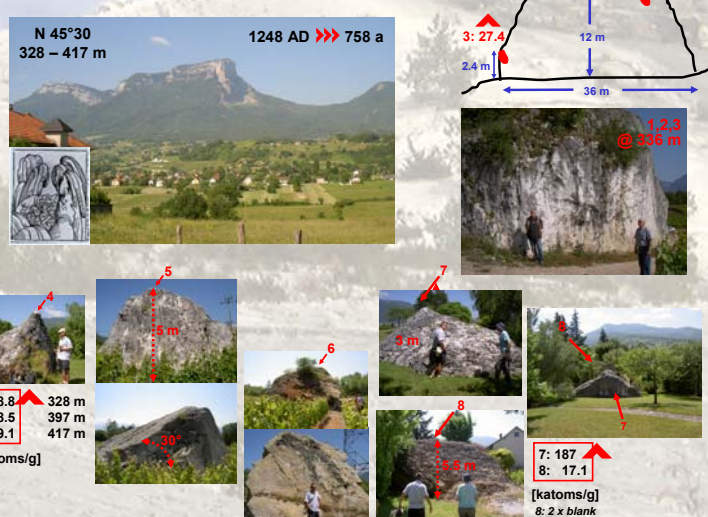
	LLNL	ETH/PSI
sample form		AgCl
sample holder	stainless steel with AgBr inlet	Cu disk with Ta insertion; AgBr inlet if necessary
extraction as		Cl ⁻
terminal voltage	8.3 MV	6.1 MV
measured ratios (this work)	$3 - 8 \times 10^{-14}$ ("Le Claps")	$2 \times 10^{-14} - 1 \times 10^{-13}$ ("Mont Granier")
blank $^{36}\text{Cl}/^{35}\text{Cl}$ (this work)	9×10^{-15}	3×10^{-15}
machine background		1×10^{-15}
"standard"	"Nishizumi"	norm. to "Nishizumi"

"Le Claps"



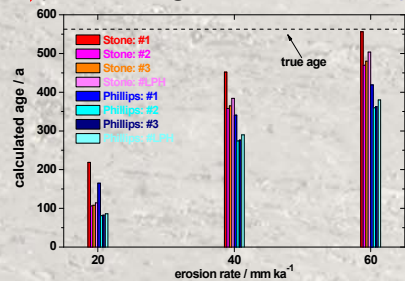
Sampling sites for calibration

"Mont Granier"



Age calculations:

- ▶ scaling factors: Stone
- ▶ production rates @ SL/HL of Stone, 1996 / Phillips et al., 2001



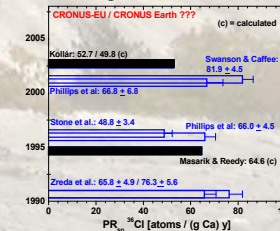
- ▶▶▶ 6 – 38 $\mu\text{g/g}$ Cl-nat
- ▶▶▶ 5 out of 8: inheritance
- ▶▶▶ 3 samples remaining
- ▶▶▶ 1 (low calcite) near blank >>> repeat
- ▶▶▶ very prelim. results !!!

Scaling factors: Stone
Production rates @ SL/HL

	Stone et al. 1996 (48.8)	Phillips et al. 2001 (66.8)
5:	692	520
6:	962	729
8:	633	479
	762 ± 175 ($\Delta = 1\%$)	576 ± 134 ($\Delta = 24\%$)
	true: 758 a	

Résumé

- ▶ still awaiting final results of some target element and element concentrations influencing the production by the $^{35}\text{Cl}(n,\gamma)^{36}\text{Cl}$ reaction >>> we cannot yet determine precise production rates
- ▶ able to measure ^{36}Cl from very young surfaces for first time
- ▶ some problems with inheritance
- ▶ it still has to be discussed how valid production rates based on this short time scale will be for the application on longer time periods >>> detailed discussion on influence of variation of Earth's magnetic field and cosmic radiation itself has to follow



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