



Enhanced Multicollector ICP-MS Coupled with a Desolvating Nebulizer for Geochronology

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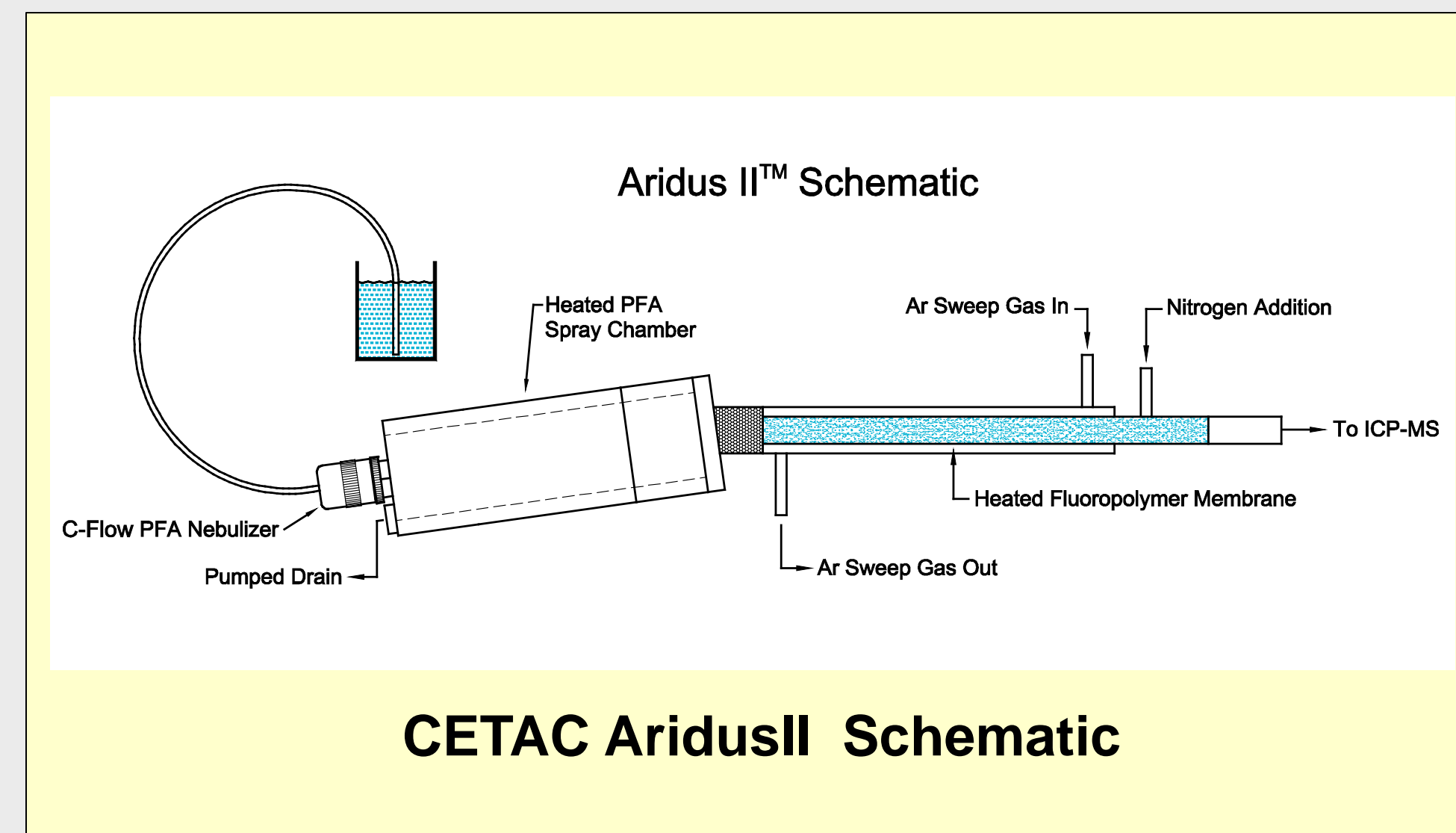
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Abstract: Multicollector ICP-MS instruments are very specialized devices for high precision isotope ratio measurements. For accurate measurement of low abundance isotopes, signal enhancement is often required. In addition, sample preparation and/or sample aerosol desolvation may be necessary to reduce or eliminate mass spectral interferences such as oxides and hydrides. This paper will examine the coupling of an enhanced multicollector ICP-MS with a desolvating nebulizer system for geochronology. The hardware specification of the ICP-MS will be detailed, including a revised vacuum system and special sampler and skimmer interface cones. Important operating conditions of the desolvating nebulizer system include argon sweep gas and nitrogen addition gas flows. Application of this coupled system to U-series dating will be described.



CETAC AridusII Desolvating Nebulizer System



CETAC AridusII Schematic



QuickWash



AridusII – Front Door Open



QuickWash Gas / Liquid Line

CETAC AridusII Advantages

- > Signal is 8-10 times greater using the AridusII (100µL/min) than the standard 50 µL/min nebulizer giving an overall effective signal increase of 4-5 times.
- > No detectable hydrides (U-series analyses).
- > Smaller samples are now routine (for U-series, use < 100 mg).
- > Measurement times are significantly reduced by 5-10 times.
- > Sample chemistry time reduced because of smaller samples.

QuickWash (QW) Accessory

- > A fast washout accessory for the AridusII PFA spray chamber.
- > Useful for analyte concentrations above 100ppb, particularly U and Th as in MC-ICP-MS.
- > Consists of a gas/liquid line which provides a tangential spray of dilute acid during the rinse cycle.
- > The QW gas flow is 2 to 3 L/min Ar with a rinse solution flow of up to 2mL/min (pumped).
- > The QW can be triggered manually or via the ASX-112FR Autosampler.
- > The QW time is preset in increments of 10 sec up to 160 sec.

MC-ICP-MS Parameters

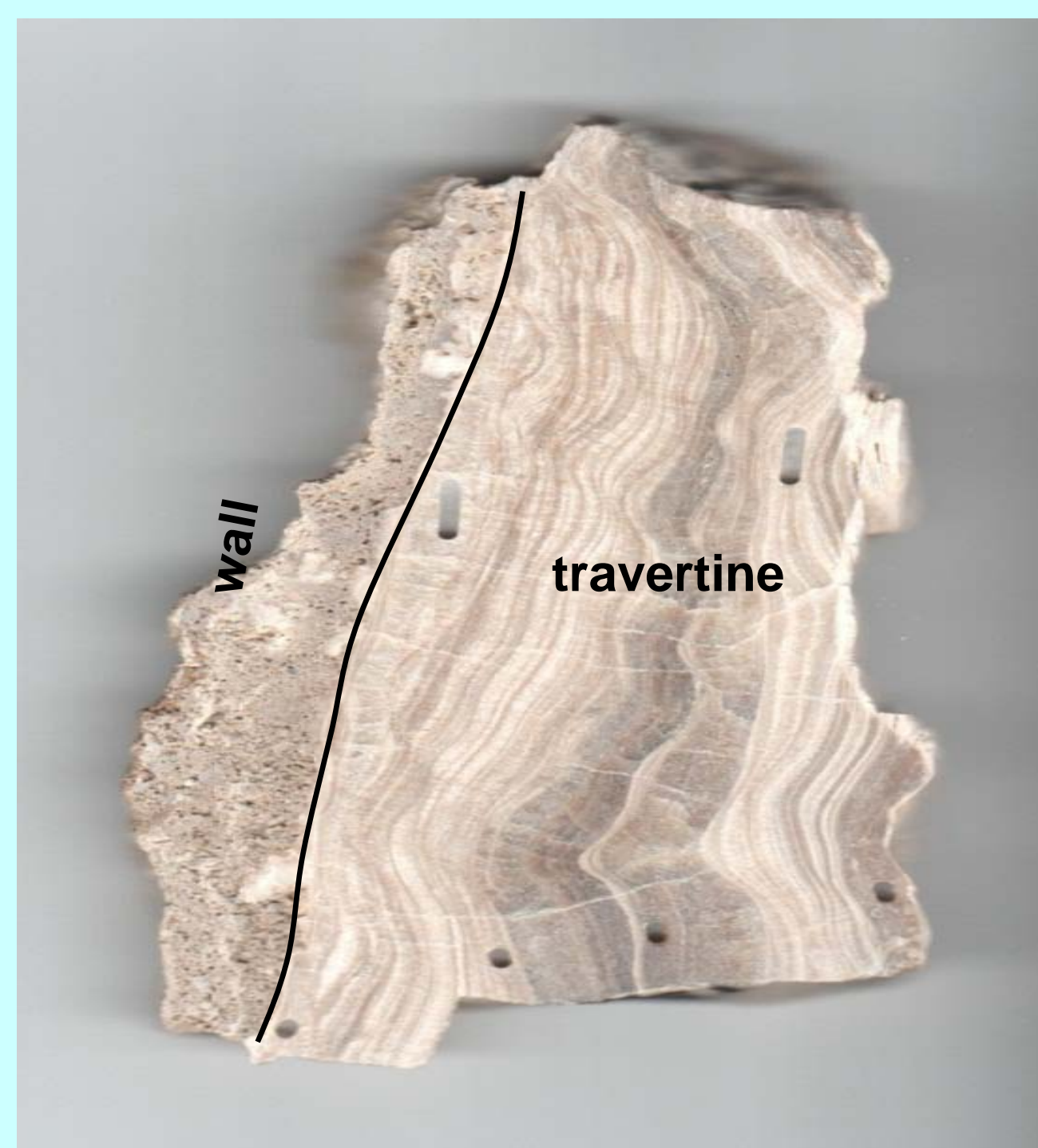
MC-ICP-MS: Thermo Neptune with Jet Interface
ICP RF Power: 1200 W
Plasma Gas: 15 L/min
Auxiliary Gas: 0.98 L/min
Nebulizer Gas: 0.86 L/min
Torch Injector: Quartz, 2.0 mm i.d.
Resolution: Low
Integration time: 16.7s
Cycles / block: 10

Desolvating Nebulizer Parameters

Nebulizer System: CETAC AridusII
PFA Nebulizer: Aspire-50
Uptake rate: 50 µL/min
Nebulizer Gas: 0.86 L/min
Spray Chamber Temp: 110°C
Membrane Oven Temp: 160°C
Ar Sweep Gas: 10.5 L/min
N₂ Addition Gas: 6 ml/min

Application:

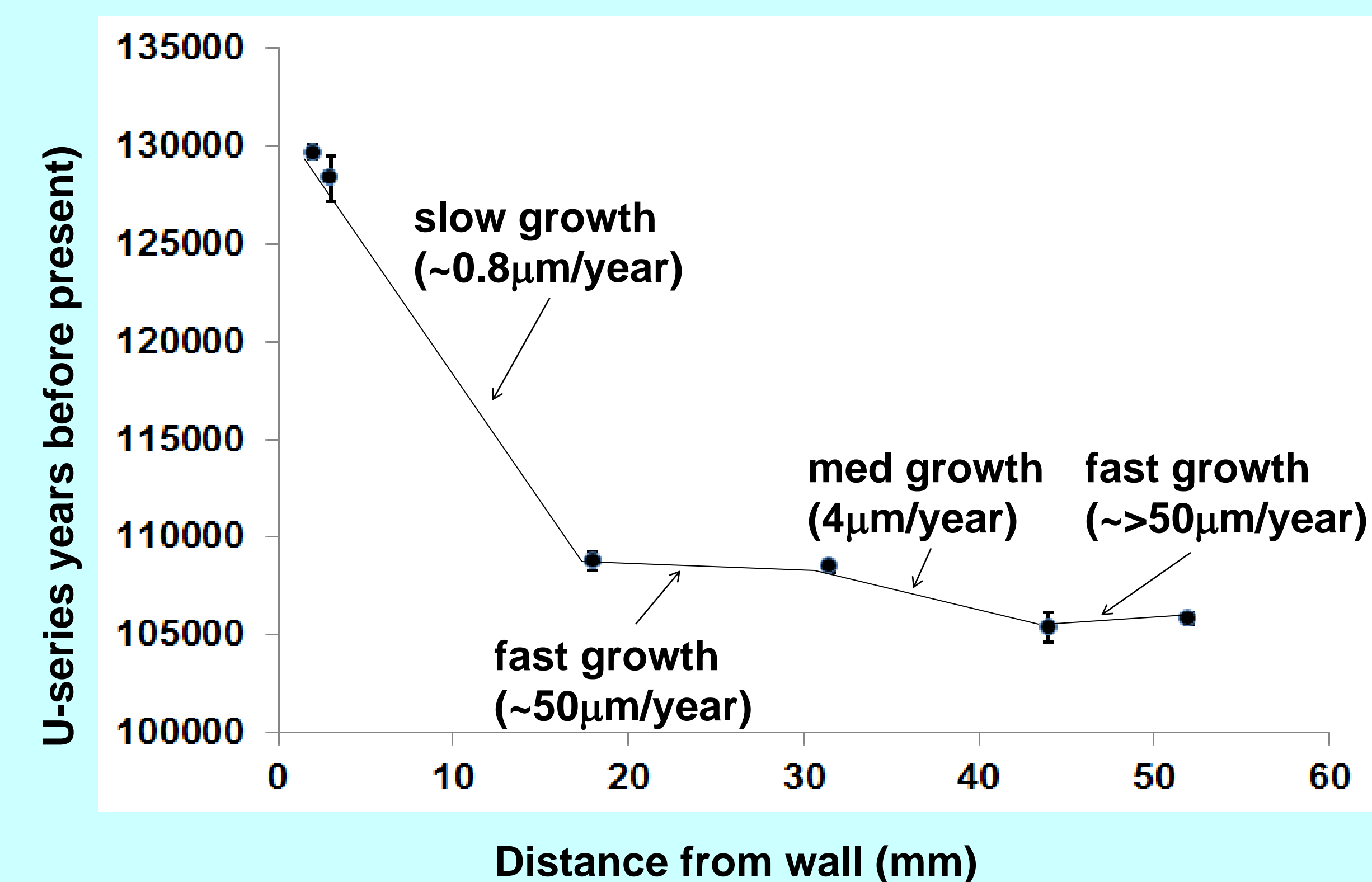
Travertine (layered limestone deposits from spring waters) growth history, Grand Canyon, USA. Sampled spots (6) are 20 to 30 mg each, taken with a computer driven mill and carbide bits.



Travertine Age by Distance from Wall

Distance from Wall (mm)	Age (yrs BP)	Abs 2σ Error (yrs BP)
2	129646	+/- 353
3	128354	+/- 1140
18	108744	+/- 488
31.5	108480	+/- 301
44	105356	+/- 777
52	105835	+/- 297

Travertine Growth Chart



Acknowledgement:

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