Fluorescence Imaging Site C

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Introduction

This presentation is a review of the data products produced by the Fluorescence Imager and the fluorescent probes during the Science Ops of Site C, 2004 field season in the Atacama Desert

Outline

• Overview of FI capabilities
• FI results on a locale by locale basis
• Summary
Overview of 2004 FI capabilities

View
• 10 cm x 10 cm directly under belly of Zoe,
• 180 µm resolution

Illumination/Excitation
• 1 J/flash Xenon flashlamp
• Four fiber bundle illumination channels
• Two intensities of “white light,” UV (325 nm – 375 nm), blue (425 nm – 475 nm), green (530 nm – 560 nm), and red (643 nm – 688 nm)

Detection
R, G, B, chlorophyll (670 nm – 810 nm), DNA probe (485 nm – 535 nm), Protein probe (590 nm – 650 nm), two other emission channels (435 nm – 485 nm) and (800 nm – 850 nm)
The Dyes Used in the Field

DNA dye, Syto BC, emission curve (Green)

DNA dye, Syto BC, absorption curve (Blue)

Protein dye, Sypro Red, absorption curve (Orange)

Protein dye, Sypro Red, emission curve (Red)

Blue Excitation Filter

DNA Emission Filter

Green Excitation Filter

Protein Emission Filter

Chlorophyll Emission Filter

Filter pass bands

Wavelength, nanometers
The Operation

Sequence

• P{RGB, chlorophyll (=blue excitation), chlorophyll check (=green excitation)}, [water spray], B{RGB, chlorophyll, chlorophyll check}, [vinegar spray], V{RGB, chlorophyll, chlorophyll check, DNA, Protein}, [fluorescent probes spray], D{DNA, Protein}.

File Nomenclature

Date  Time  FL  Sequence Step  Filter Set  Image Process  Image Quality
Z040917_1531_013FIP54X62MS.rawS

45X74M = Chlor
54X74M = ChlorChk
45X51M = DNA
54X62M = Protein
ND1RGB = RGB comp

N = no flash
F = flash
S = F-N subtracted
rawS, lowS
Rating System

Four-point rating system to be unambiguous:

• Biological morphology
• Chlorophyll positive
• DNA dye positive
• Protein dye positive
What did we find?

Sol 9, Locale 25
Before Plow

This rock is one of many in the field-of-view that showed positive for the dyes.

First sample of the science ops again!

Rating: 3 out of 4 (light-colored veins conducive to endothilic life, both dyes)
What did we find?

Sol 9, Locale 26
Looks like we detected chlorophyll and both dyes!

Wrong! Sunlight shining at end of day created an artifact!
What did we find?

Sol 10, Locale 26

Same field-of-view as Sol 9, Locale 26

No chlorophyll; both dyes evident on rocks and in light-colored soil

Rating: 2 out of 4
What did we find?

Sol 11, Locale 34

No chlorophyll; stronger Protein dye than DNA dye

Rating: 2 out of 4
What did we find?

Sol 12, Locale 34

No chlorophyll; no DNA signal, only Protein signal

Rating: 1 out of 4
What did we find?

Sol 12, Locale 36

No chlorophyll; the dyes lit almost every rock

Rating: 2 out of 4
Conclusion

The dyes lit up much more than expected, as compared to Site B. This is either a great find or a strange reaction with the soil and rock minerals. Are we close to unambiguous detection?