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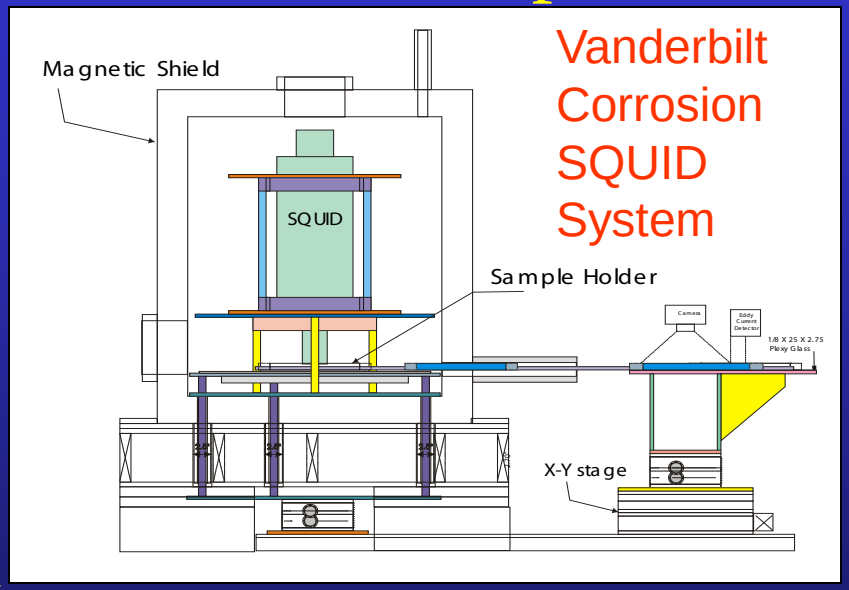
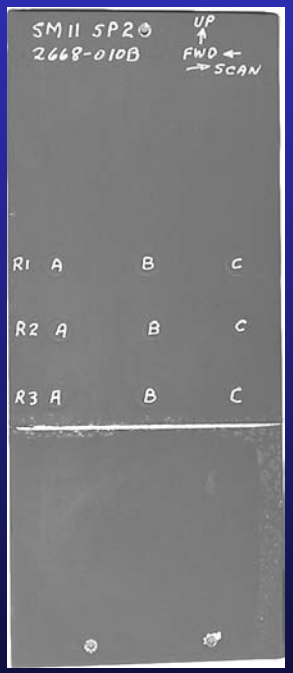
DEPARTMENT OF PHYSICS AND ASTRONOMY, VANDERBILT UNIVERSITY

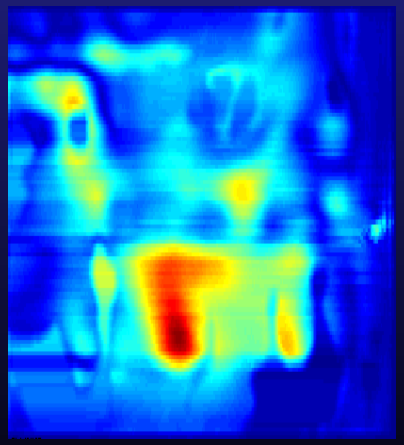
Magnetic Imaging of Ongoing Corrosion ACTIVITY in Aircraft Lap Joints

- Corrosion DAMAGE can be detected by various NDE techniques
- Corrosion ACTIVITY can be studied for exposed corrosion using standard electrochemical techniques
- Only SQUIDs can detect ongoing hidden corrosion activity, as in an aircraft lap joint.



KC-135 lap joint





SQUID image of corrosion activity

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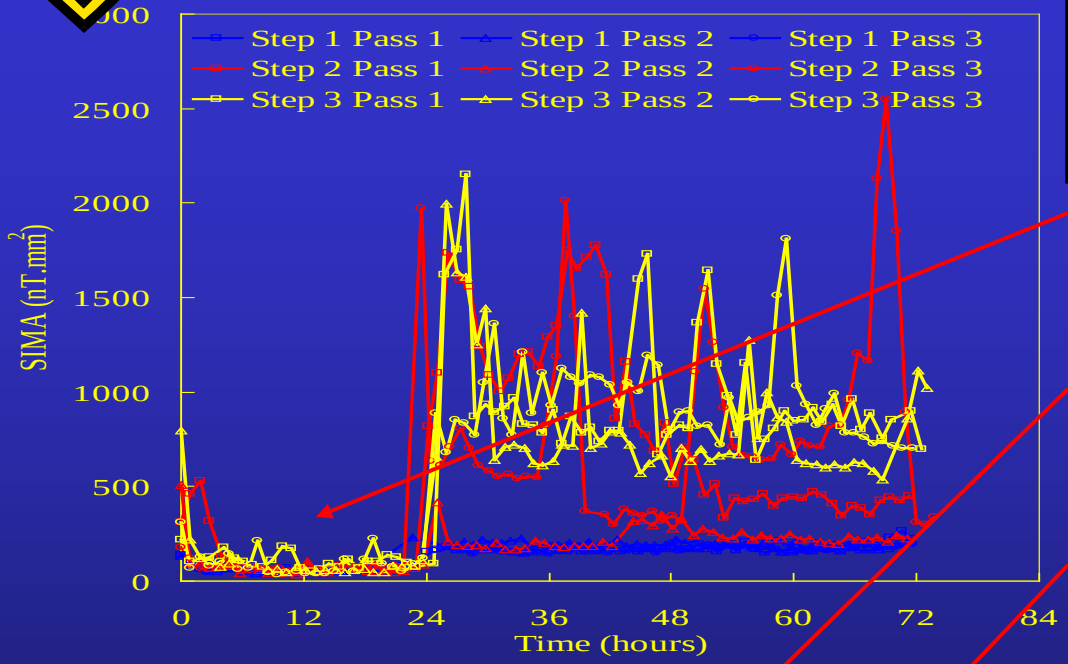
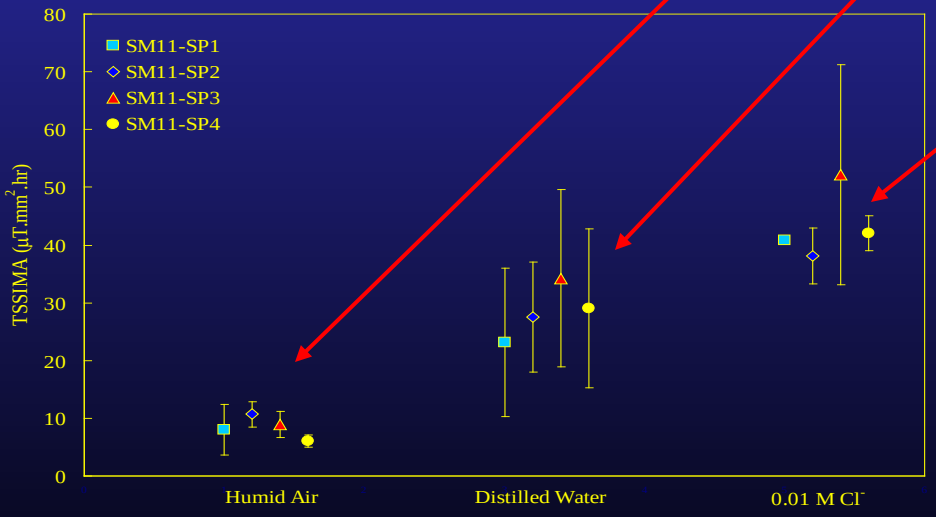
Summed magnetic activity versus time for old aircraft lap joints





- Reproducible dry background
- Low activity in 98% relative humidity air
- Distilled H_2O activates the chemistry within the lap joint
- 0.01 M chloride shows higher activity
- SQUIDs provide a unique research tool for studying hidden corrosion

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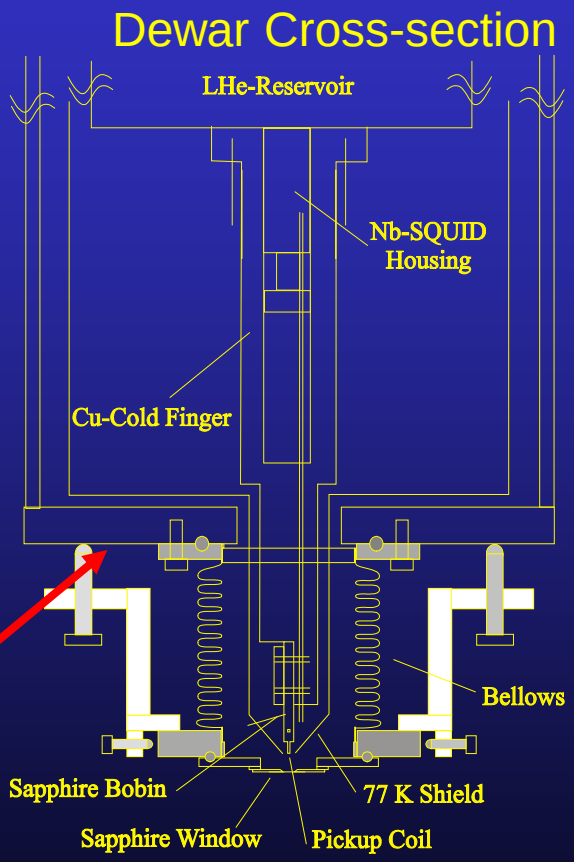
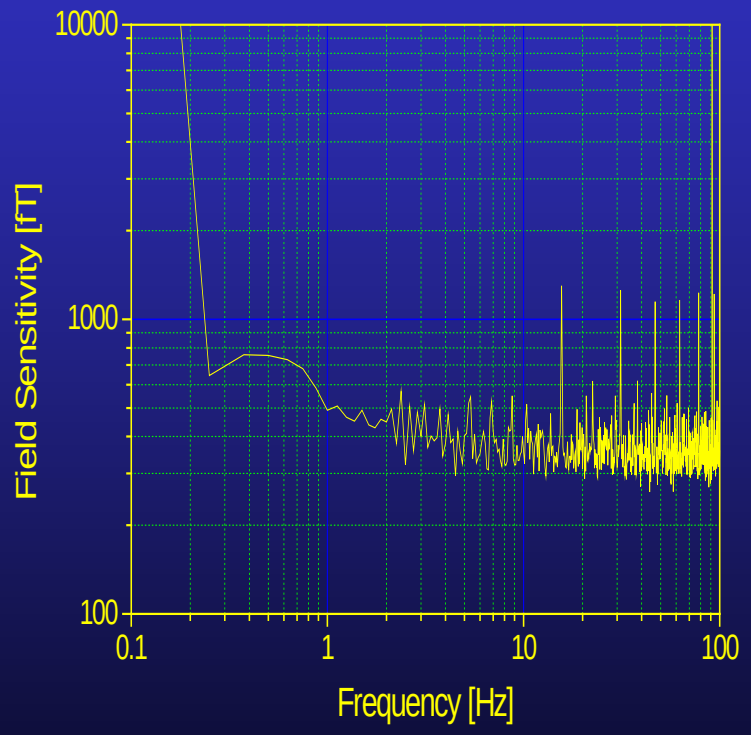
High Resolution LTS-SQUID Microscope for Room-Temperature Samples



4K-300K Sensor-Sample Spacing < 100 μm



Field sensitivity
350 fT/Hz$^{-1/2}$ @ f>1Hz

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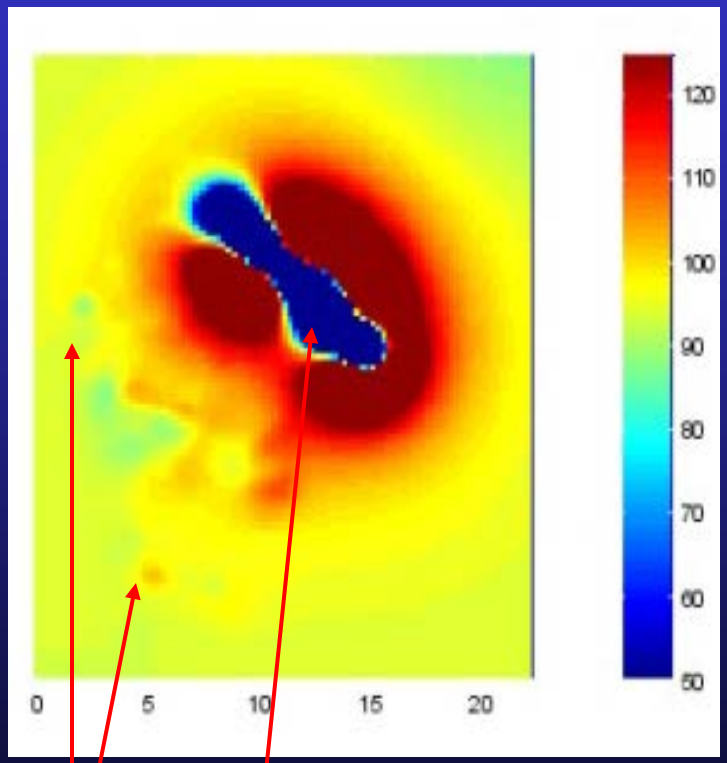
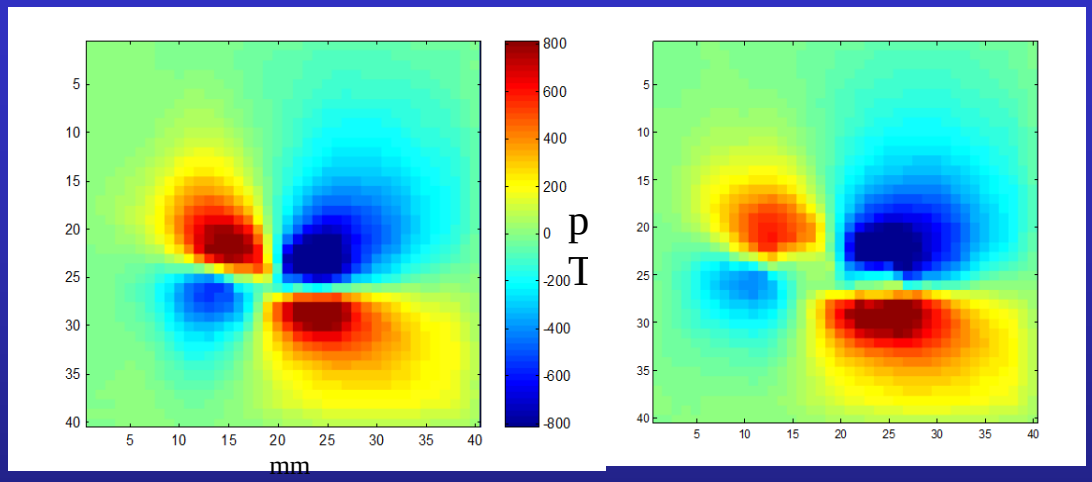
Remanent Magnetization of Martian Meteorite ALH 84001



Crust from reentry

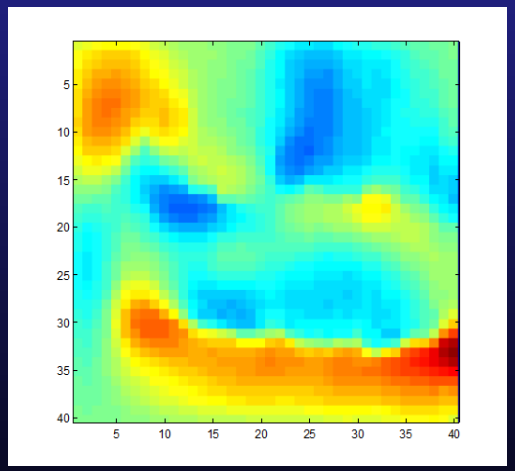
Fine structure that was not annealed upon reentry

Propagation of Action Currents in Cardiac Tissue

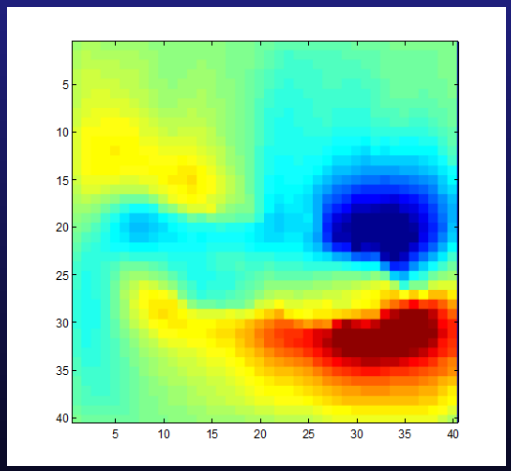


1 ms after stimulus

4 ms



10 ms



16 ms