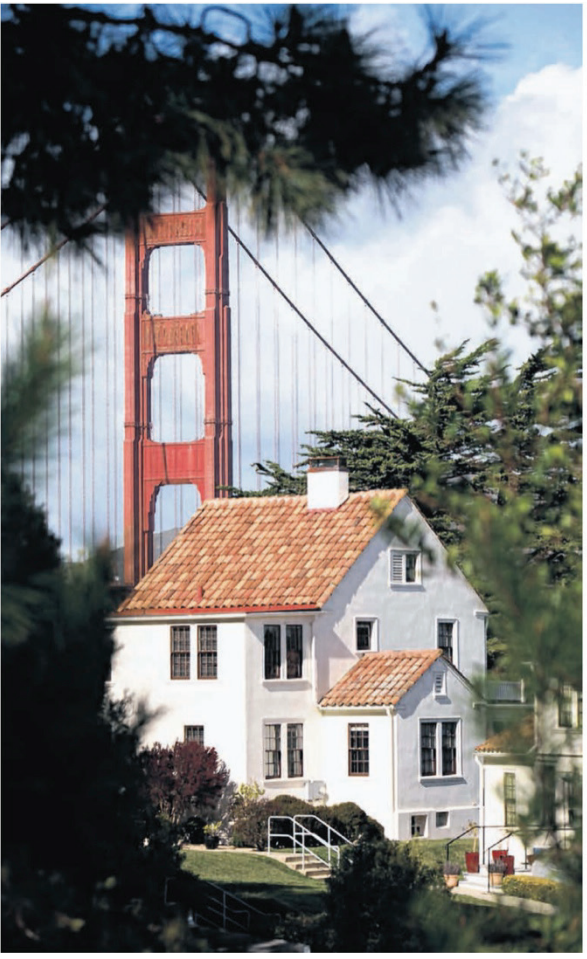
LBNL Heat Island Group



COOL WALLS U.S. NATURAL EXPOSURE PROGRAM: PRELIMINARY ANALYSIS OF 3-YEAR RESULTS

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Heat Island Group
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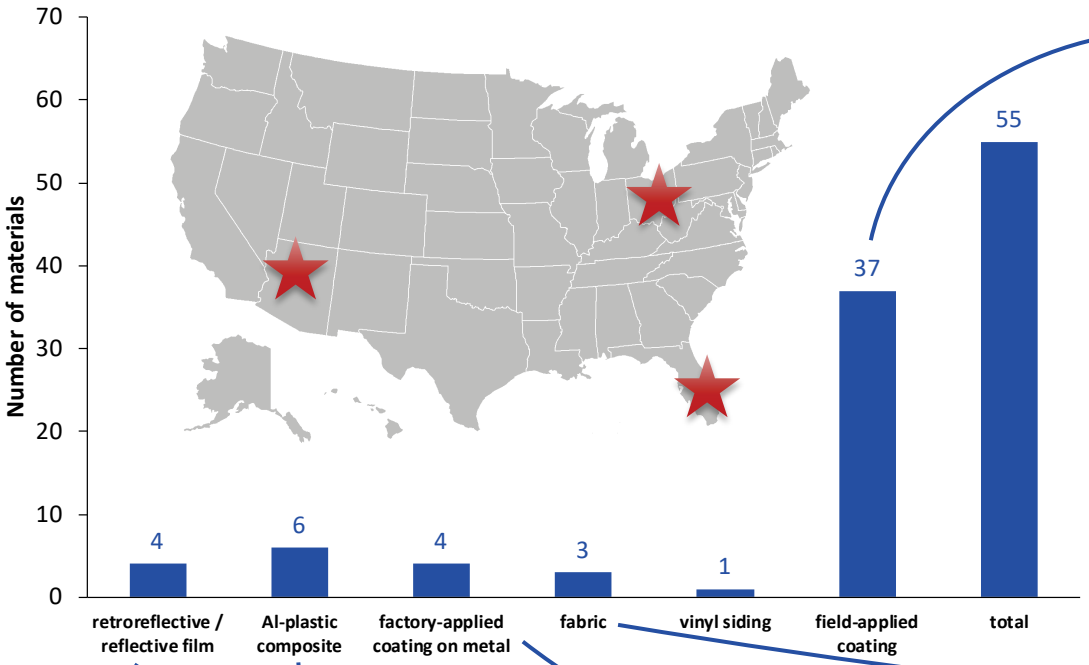
Source: Lea Suzuki, San Francisco Chronicle, 10 February 2013

Scope and goals of the Cool Walls California & U.S. exposure programs

- **Evaluate radiative performance** of wall products
- Cover **main types of wall materials** and coatings typically used in residential and commercial construction
- Include **low-, medium-, and high-albedo** products
- Include both **conventional and advanced/innovative materials** (e.g., containing cool pigments, dirt-resistant formulations or self-cleaning functionalities)
- Include both **commercial** and **experimental** products
- Cover **main California climate zones** – later extended to three **U.S. CRRC exposure sites** in Arizona, Florida and Ohio
- **Exposure duration**: **2 years** in California program; **5 years** in national program

The 55 materials exposed in the US program encompass a wide variety of types, substrates, and technologies



Field-applied paints

- Substrates:
  - Wood
  - Fiber cement
  - Concrete
- Conventional paints
- Dirt-resistant paints
- Cool colors
- Commercial products
- Experimental products
- Initial SR: 0.06 to 0.88

Architectural fabrics

- Self-cleaning
- Photocatalytic
- Commercial products
- Initial SR: 0.74

Sandwich panels

- Fluoropolymer coatings
- Commercial products
- Initial SR: 0.51 to 0.71

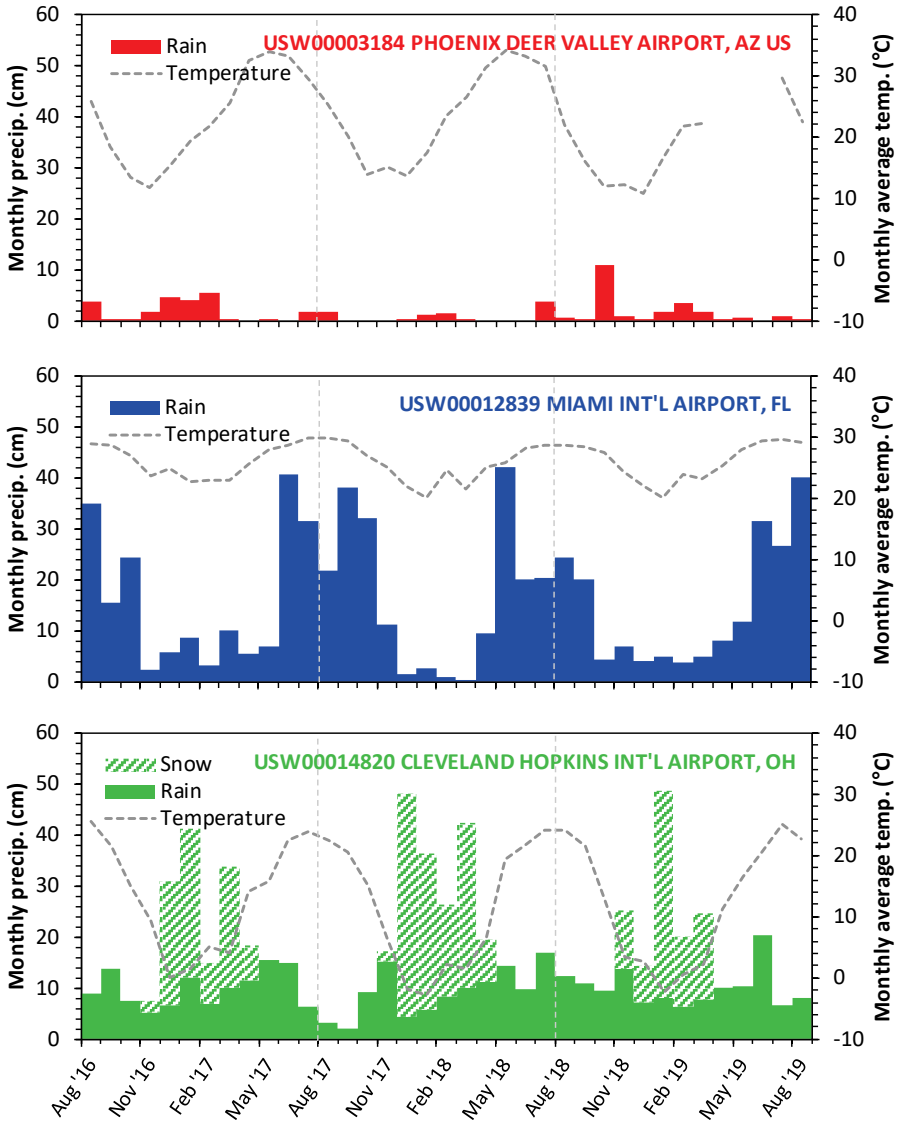
Factory-coated metals

- Substrates:
  - Steel
- Fluoropolymer coatings
- Cool colors
- Commercial products
- Initial SR: 0.28 to 0.73

Retroreflective & reflective films

- Traffic safety films
- Mirror-like films
- [not yet characterized]

Wall materials in the U.S. program were naturally weathered in Arizona, Florida, and Ohio (3rd of 5 years)



New River, Arizona

- Desert environment/climate
- Hot summers, mild/cool winters
- Dry, low humidity
- High levels of solar radiation
- Low levels of urban pollution

Miami, Florida

- Subtropical environment/climate
- Hot summers, mild/warm winters
- Wet, high humidity
- High levels of solar radiation

Medina, Ohio

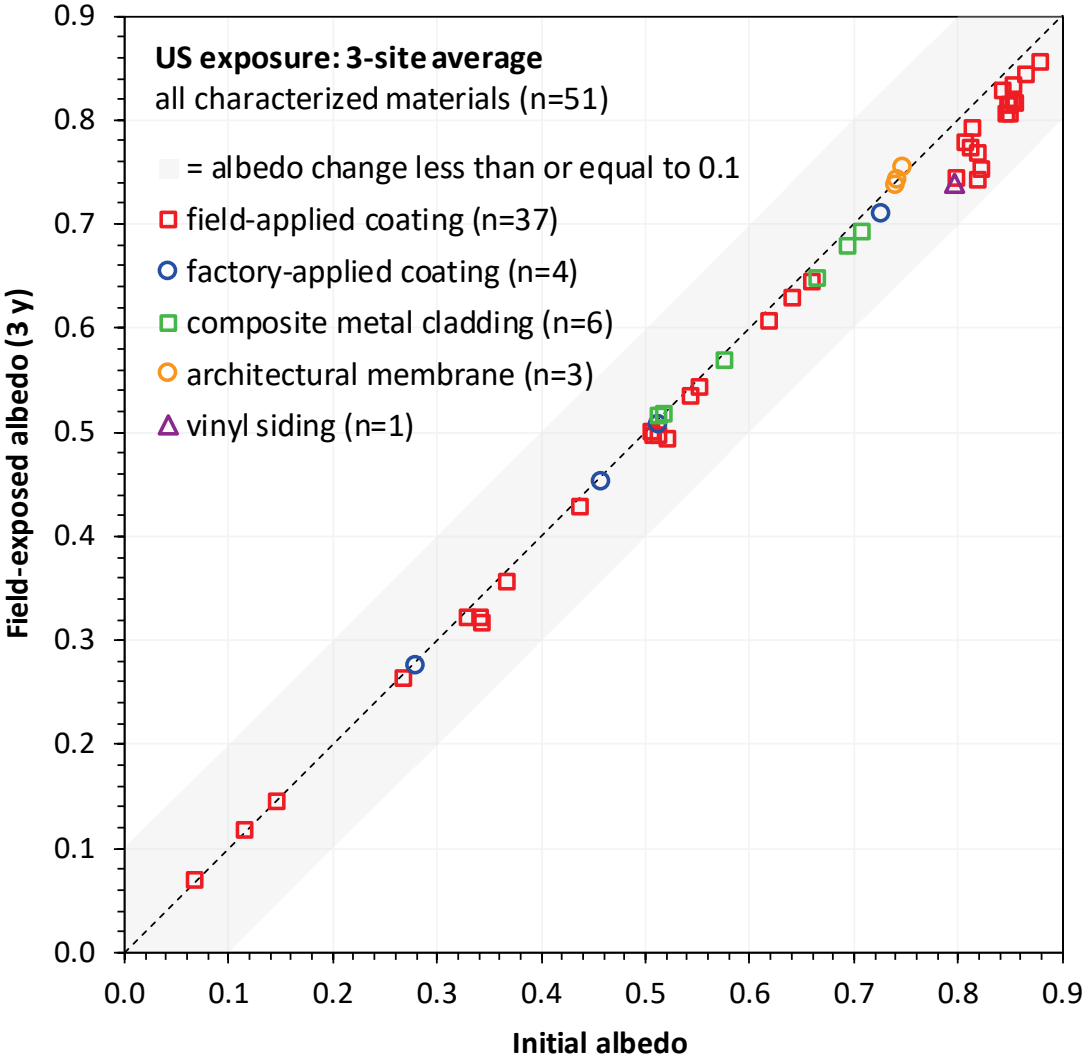
- Northern temperate environment/climate
- Warm summers, cold winters
- Humid, no defined dry season
- Lower levels of solar radiation (relatively)
- Some urban pollution

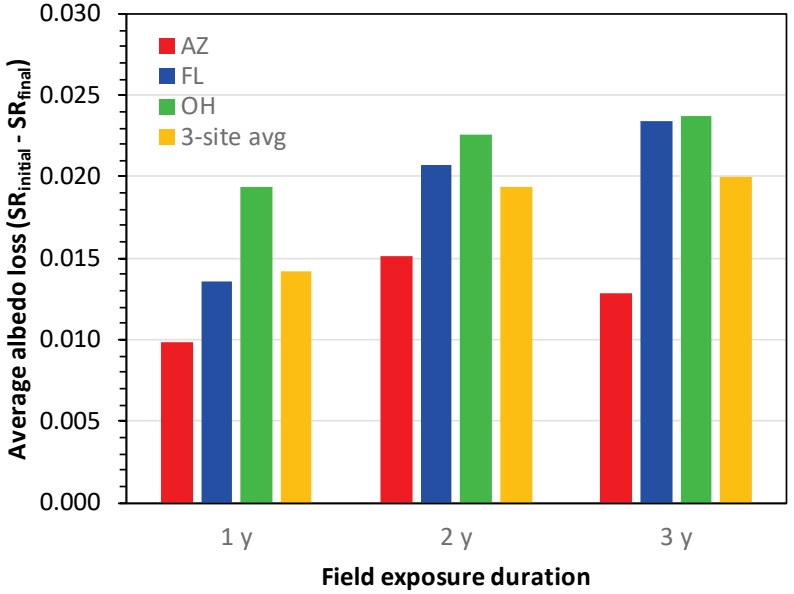
Exposure began in Aug 2016, and we recently completed the third-year collection

Site	1 yr	2 yr	3 yr	4 yr	5 yr
New River, AZ	✓	✓	✓	Aug '20	Aug '21
Miami, FL	✓	✓	✓	Aug '20	Aug '21
Medina, OH	✓	✓	✓	Aug '20	Aug '21

This **5-year study w/ annual collections** focuses on **long-term changes** in wall albedo

At the 3-year mark, a majority of the materials have exhibited little albedo change

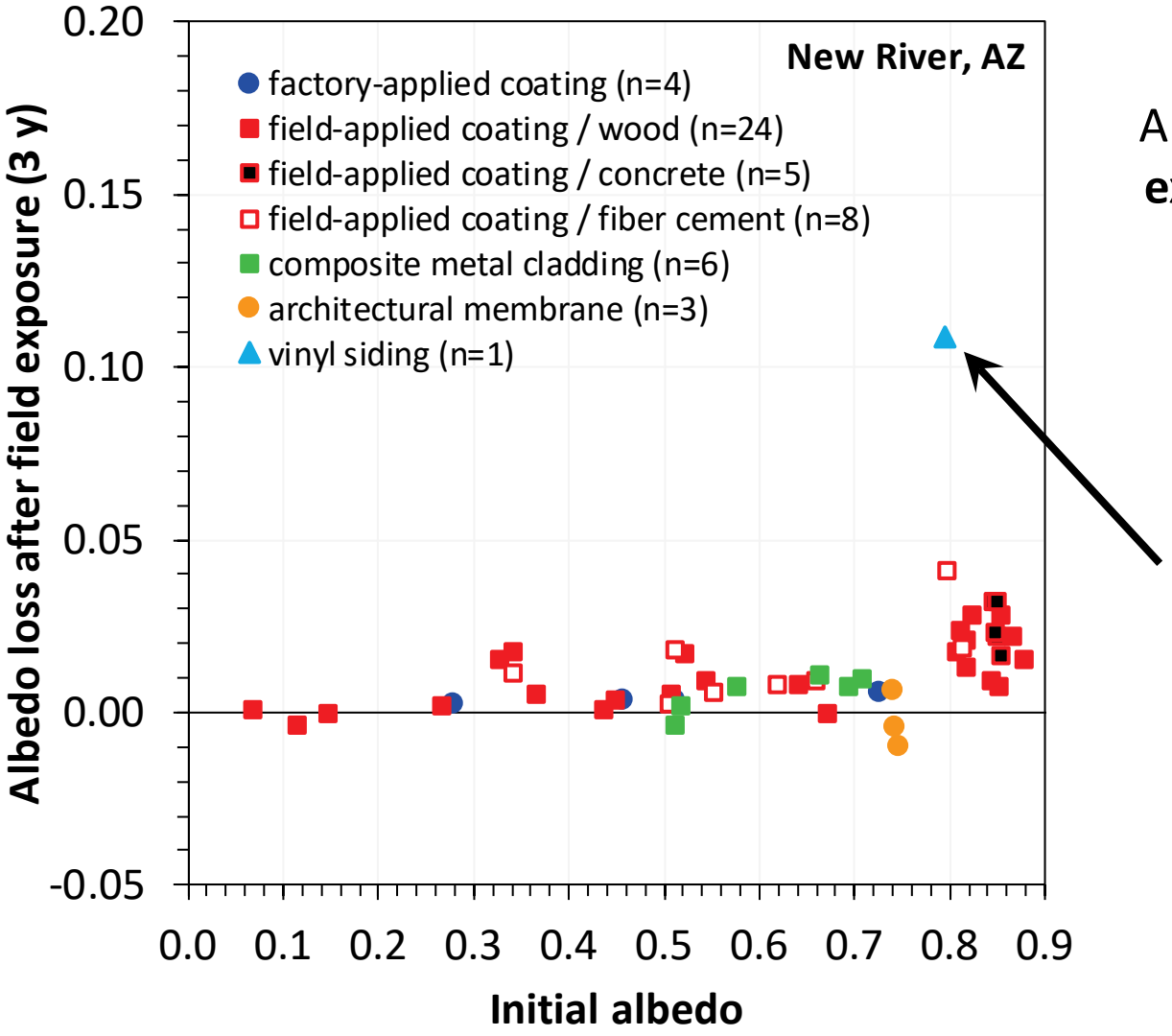




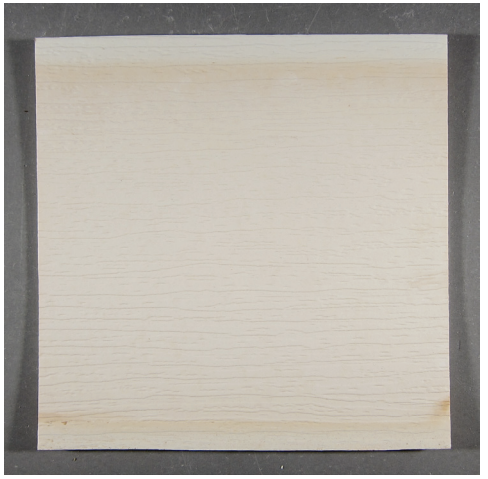
- Average albedo loss across all 3 sites: 2 points (**ΔSR = 0.02**)
- At year 3, we continue to see the same trends as identified in year 2:
  - Most materials tested exhibited trivial albedo change
  - The more significant instances of albedo loss were observed in white field-applied paints (FL, OH; soiling) and vinyl siding (AZ; yellowing)

Note: The data shown here have not yet been quality-checked.

At the 3-year mark, the average albedo loss of materials tested in AZ is 0.01



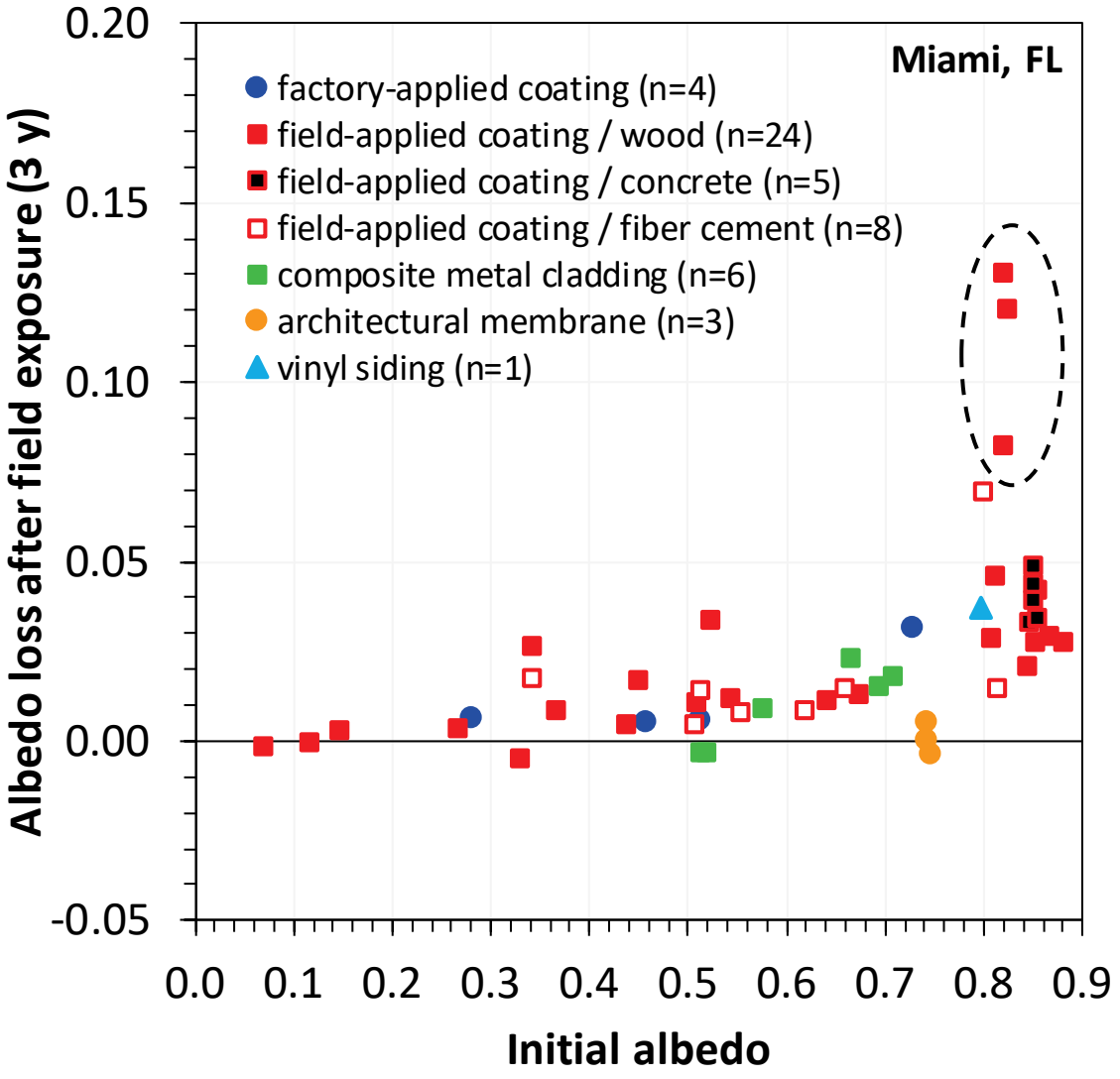
At the 3-year mark in Arizona, **50 of 51 materials exhibited albedo losses of less than 5 points (ΔSR < 0.05)**



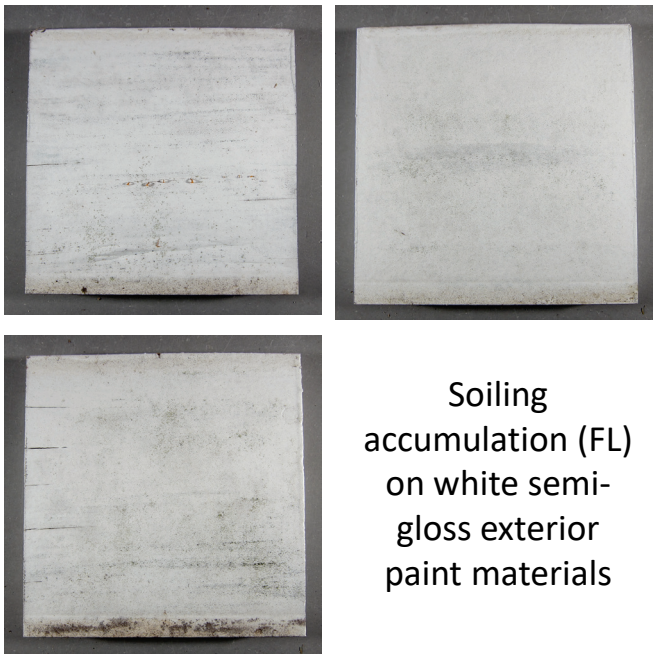
Yellowing of a white vinyl siding material

Note: The data shown here have not yet been quality-checked.

At the 3-year mark, the average albedo loss of materials tested in FL is 0.02



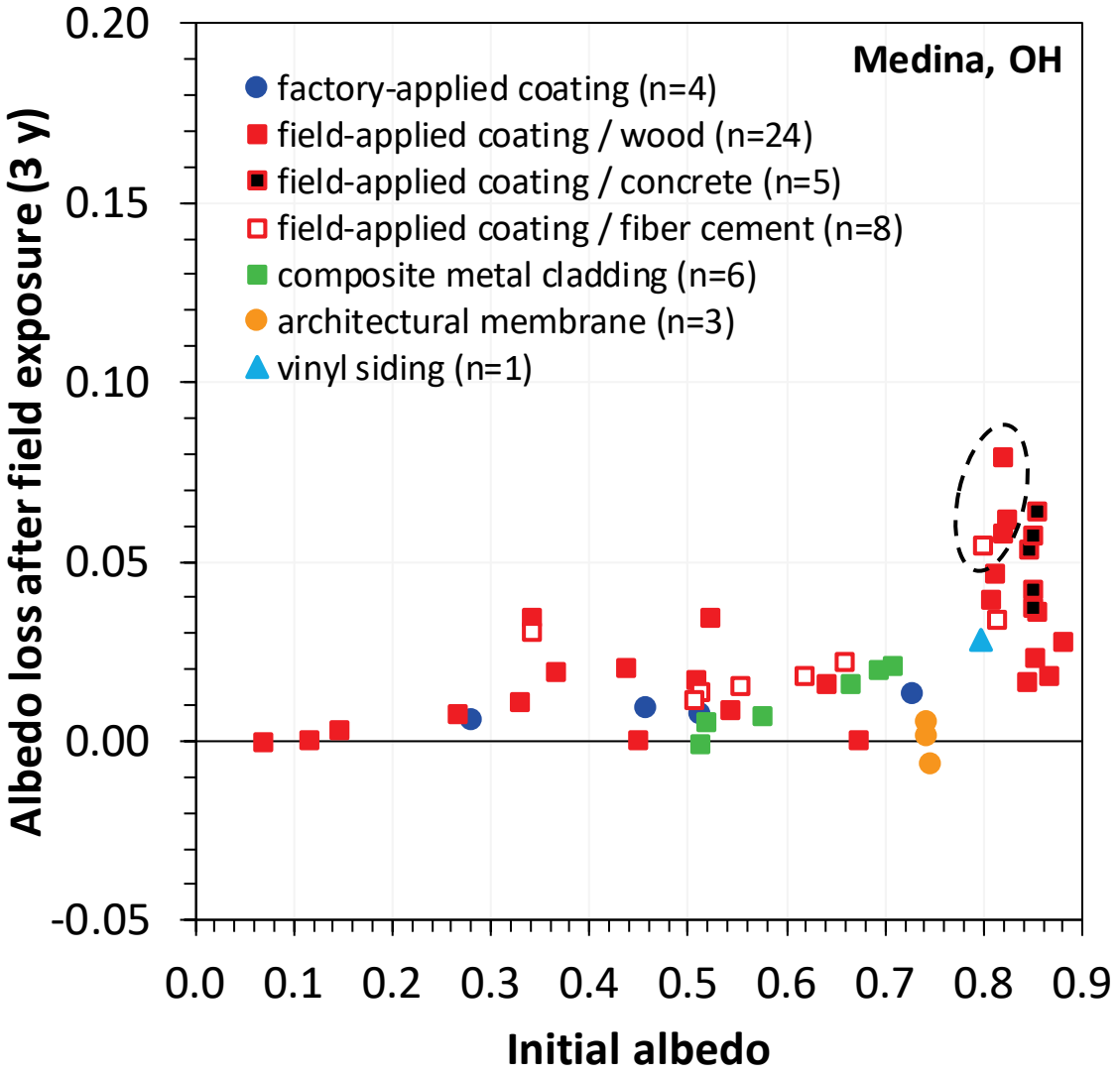
At the 3-year mark in Florida, **47 of 51 materials exhibited albedo losses of less than 5 points (ΔSR < 0.05)**



Soiling accumulation (FL) on white semi-gloss exterior paint materials

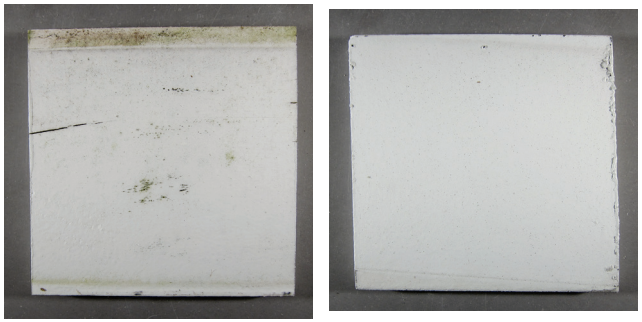
Note: The data shown here have not yet been quality-checked.

At the 3-year mark, the average albedo loss of materials tested in OH is 0.02



At the 3-year mark in Ohio:

- **44 of 51 materials exhibited albedo losses of less than 5 points (ΔSR < 0.05)**
- **All 51 materials exhibited albedo losses of less than 8 points (ΔSR < 0.08)**



Soiling accumulation (OH) on a white semi-gloss exterior paint (left), and a white matte exterior paint (right)

Note: The data shown here have not yet been quality-checked.

Next steps

- **CA program:** Continue with additional in-depth analyses of the current dataset.
- **U.S. program:** Continue retrieving specimens and analyzing results over next 2 years.
- Meet separately with each partner to **report in full detail** results obtained with their products in both the CA and U.S. exposure programs.
- **Report** to CEC aggregated results that preserve confidentiality of each product/manufacturer, unless explicitly waived.
- **Ultimate goal:** contribute to development of **infrastructure** that facilitates adoption of cool walls in U.S. construction.