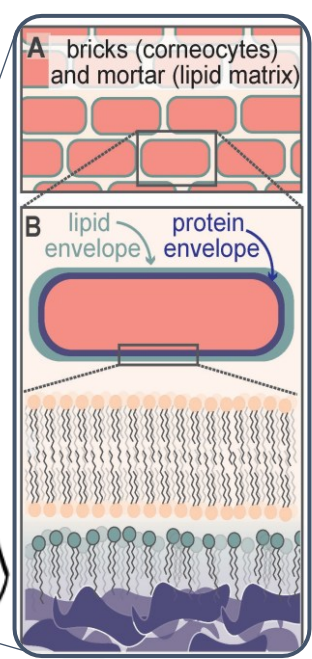


# A Small Lipid with a Big Impact: Cholesterol Sulfate and Skin Barrier Structure



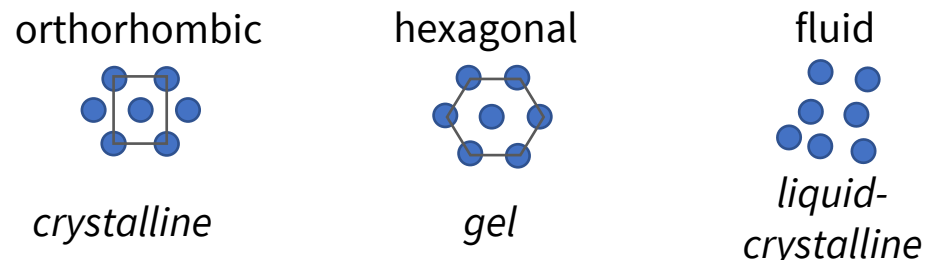
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## BACKGROUND

An often-used analogy for the skin barrier is a "brick and mortar" structure with corneocytes (cells) embedded in a highly organised lipid matrix. This ordered multi-lamellar matrix consists primarily of ceramides, free fatty acids and cholesterol.<sup>1</sup>

### lipid matrix lateral packing



## KNOWLEDGE GAP

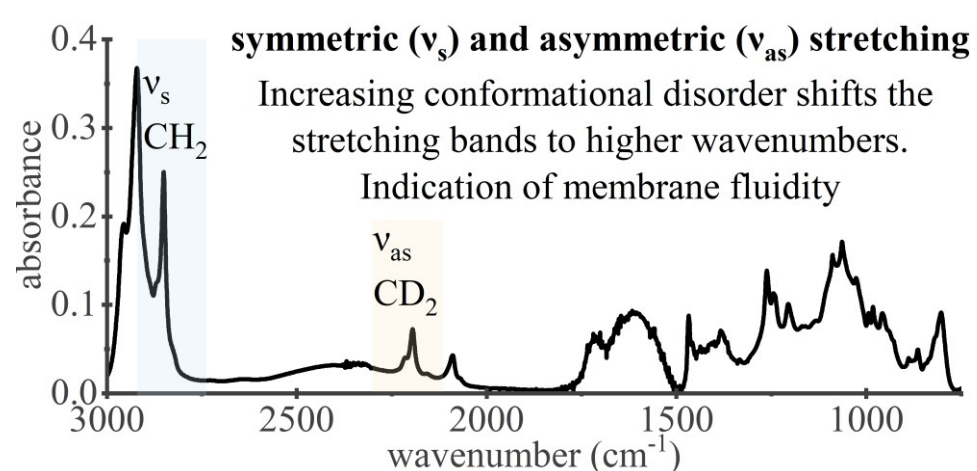
Cholesterol sulphate is a minor but biologically important component of the skin lipid matrix. Elevated levels are associated with several skin disorders, yet its role in lipid organisation remains poorly understood.<sup>2</sup>

## AIM

To determine how cholesterol sulphate alters the phase behaviour, molecular organisation, and reorganisation kinetics of the skin lipid matrix.

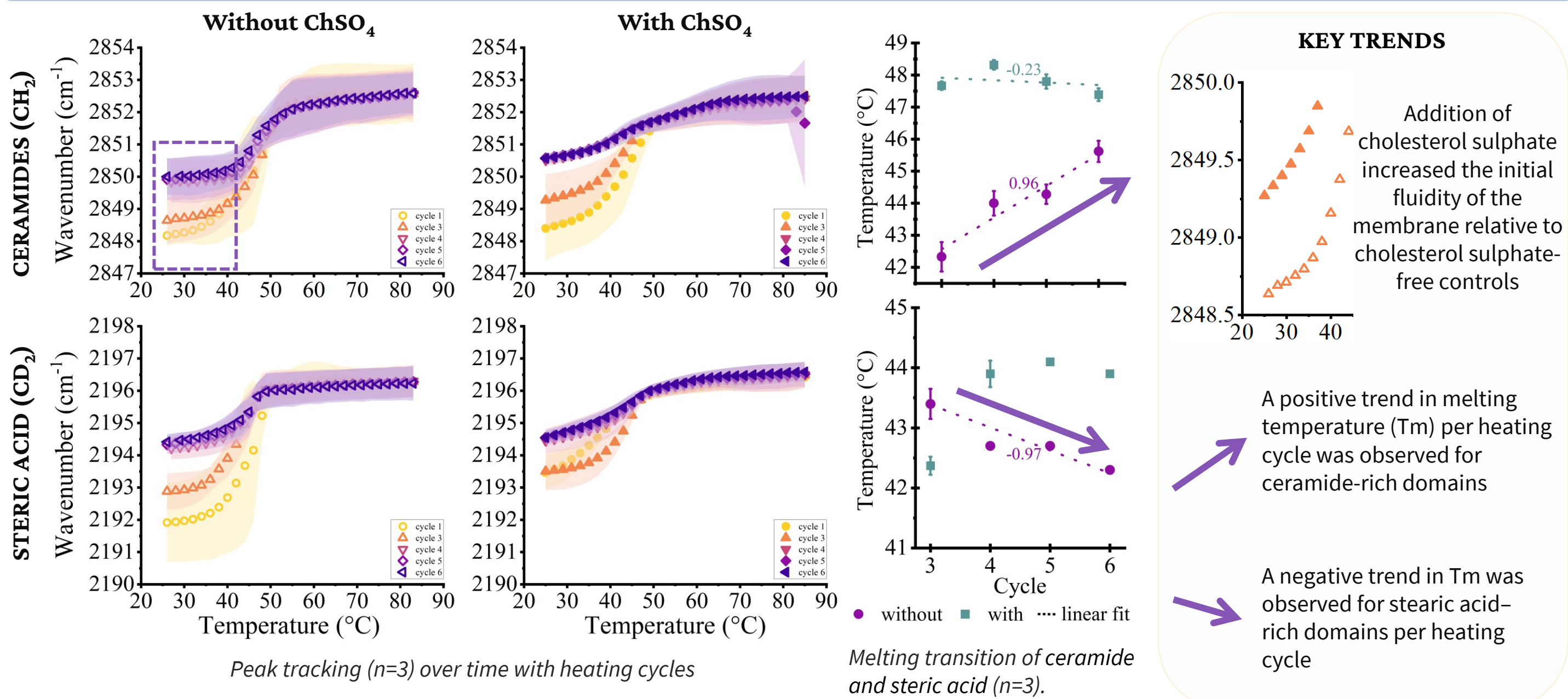
## METHOD

**Transmission FT-IR** on hydrated (pH 5.4, natural pH of skin barrier) lipid films of  $d_{35}$ -stearic acid, bovine ceramides, cholesterol, **cholesterol sulphate (ChSO<sub>4</sub>)** in molar ratios 1:1:1:0 & 1:1:1:1

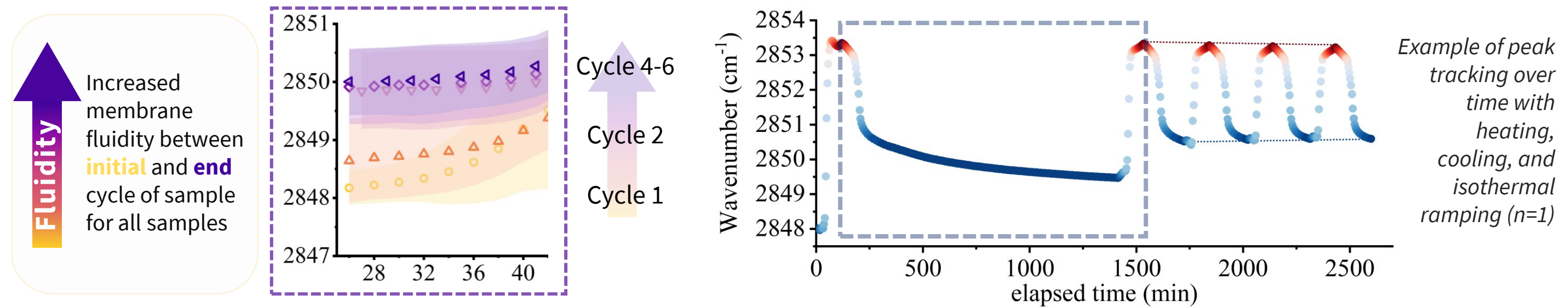


**Temp. ramping**  
 cycle 1. RT → 85 → 26  
 cycle 2. 26 for 18hr,  
 cycle 3-6. 26 → 85 → 26

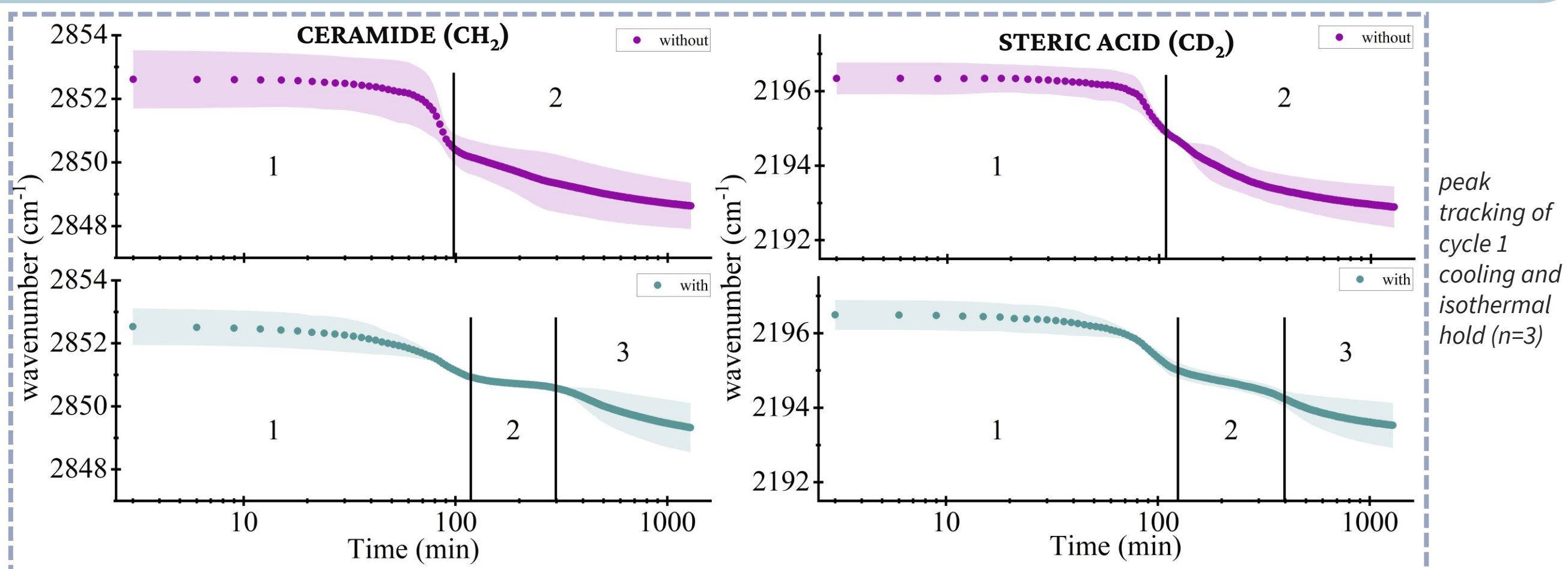
## CHOLESTEROL SULPHATE RE-ORDERS FLUIDITY OF CERAMIDE AND STERIC ACID RICH REGIONS DIFFERENTLY



## CYCLES 4–6 SHOW ENHANCED FLUIDITY LINKED TO LONG-TERM RELAXATION PROCESSES



## CHOLESTEROL SULPHATE ALTERS COOLING-INDUCED LIPID REORGANISATION, PRODUCING THREE DISTINCT KINETIC REGIMES



- Cholesterol sulphate increases lipid matrix fluidity under all conditions tested.
- Cooling reveals three distinct kinetic regimes of lipid reorganisation in cholesterol sulphate-containing membranes.
- Cholesterol sulphate acts as a structural modulator of lipid packing, reshaping how ceramide-rich phases reorganise during cooling

