

Canopy process in changing Climate 参加報告  
渡辺 誠

# IUFRO

## (International Union of Forest Research Organizations)

Division 1 – Silviculture

Division 2 – Physiology and Genetics

**Unit 2.01.12 – Canopy processes**

Division 3 – Forest Operations Engineering and Management

Division 4 – Forest Assessment, Modelling and Management

Division 5 – Forest Products

Division 6 – Social, Economic, Information and Policy Sciences

Division 7 – Forest Health

Division 8 – Forest Environment



# オーストラリアへ

6-7日 移動

新千歳 10/6 17時発

→成田

→シドニー

→メルボルン10/7 11時着



# 初日（開始まで1時間ほど散歩）



# 初日(ウェルカムレセプション～パブリックレクチャー)



# ビクトリア州での滞在

8日 移動(8:00-17:00)

メルボルン

→フォールスクリーク

9-10日

カンファレンス



# 移動日(メルボルン→フォールスクリーク)



# フォールスクリークでのセッションテーマ

- Theme 1:  
Water and Carbon Fluxes, pools and turnover
- Theme 2:  
Structural and Physiological acclimation of forest canopies



# Unsolved problems in whole tree physiology

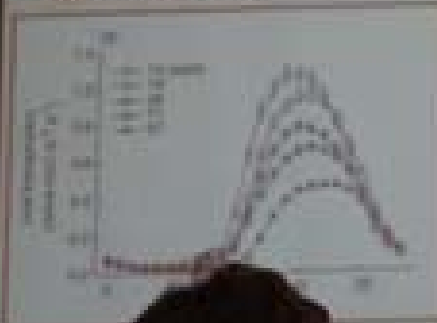


## The Known Unknowns!

- Carbohydrate storage<sup>o</sup>: how it works, what it does
- Respiration<sup>o</sup>: role in C balance, mechanistic model
- Phloem transport: measurement, regulation
- Carbon sinks: controls, mechanisms
- Sink versus source: control of photosynthesis<sup>o</sup>: occurrence and mechanism
- Mycorrhizae: costs, benefits, regulation
- Size-related growth decline<sup>o</sup>: mechanism(s)
- Carbon and nutrient partitioning: mechanism

## Examples of how tree physiology affects ecosystem fluxes

Water fluxes change with tree size



Wang et al. 2000, *Geophysica* 118:151-155

## The Known Unknowns!

- Water transport under water stress: mechanism
- Water storage: importance for water flux
- Crown architecture: optimization of hydraulic capacity (delivering water to keep stomata open), biochemical capacity (partitioning N to gain the most from a limited resource) both reflecting the light environment which is the result of both the crown architecture and surrounding system.
- Molecular control of physiology and allocation

# Dr. Michael Ryanの発表で示された The known unknowns

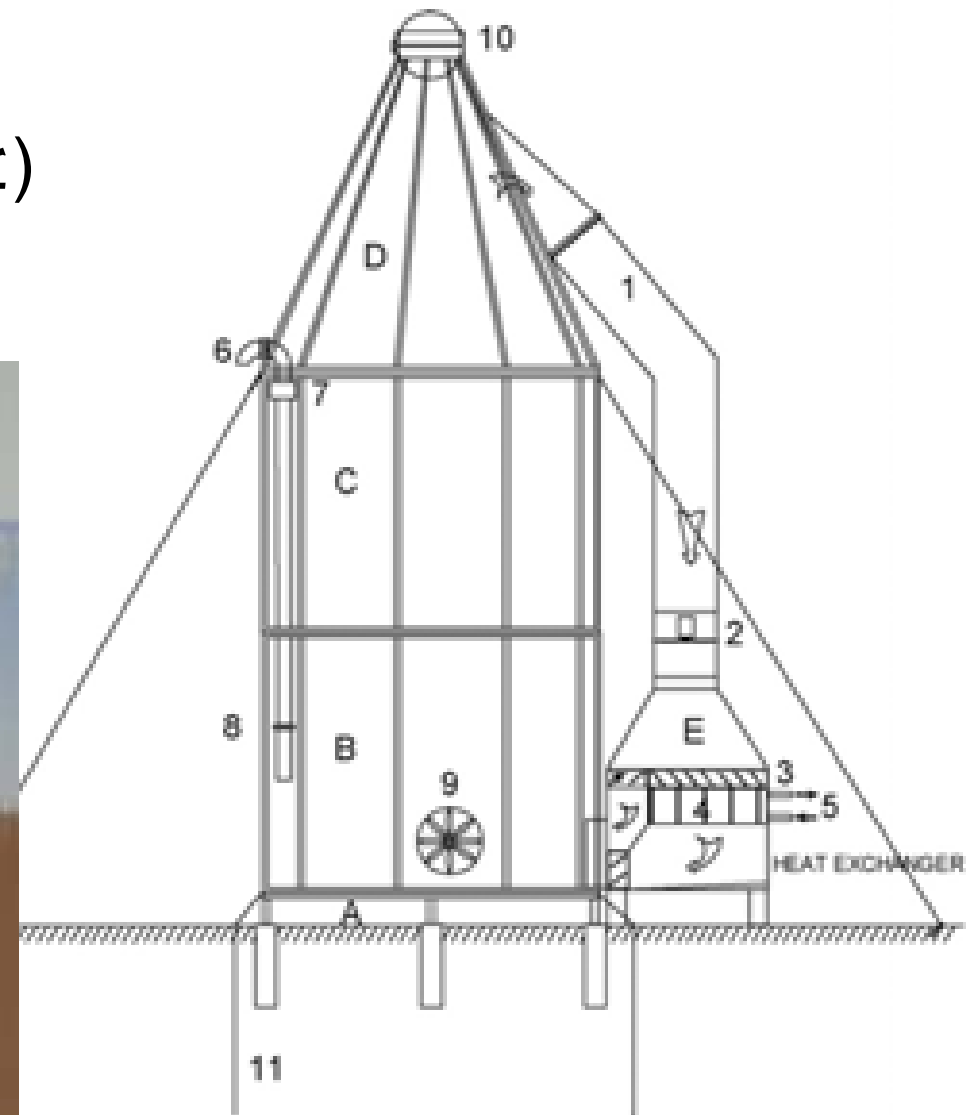
1. The role of stored carbohydrates in sustaining physiology in lean time
2. The mechanisms that control storage input and release
3. The regulation of phloem transport at different time scales
4. The role of autotrophic respiration in regulating plant carbon balance and mechanistic model for autotrophic respiration
5. Controls over processes that regulated plant 'sinks' for carbon
6. Sink regulation of tree photosynthesis: mechanisms and occurrence
7. The costs and benefits of mycorrhizal symbionts
8. The mechanisms of size-related decline on wood growth
9. The mechanisms that regulate carbon and nutrient allocation
10. Maintenance of water transport under water stress
11. The role of stored water in maintaining water transport
12. The molecular control of physiology

# Whole-Tree Chamber

CO<sub>2</sub>と温度などの複合影響

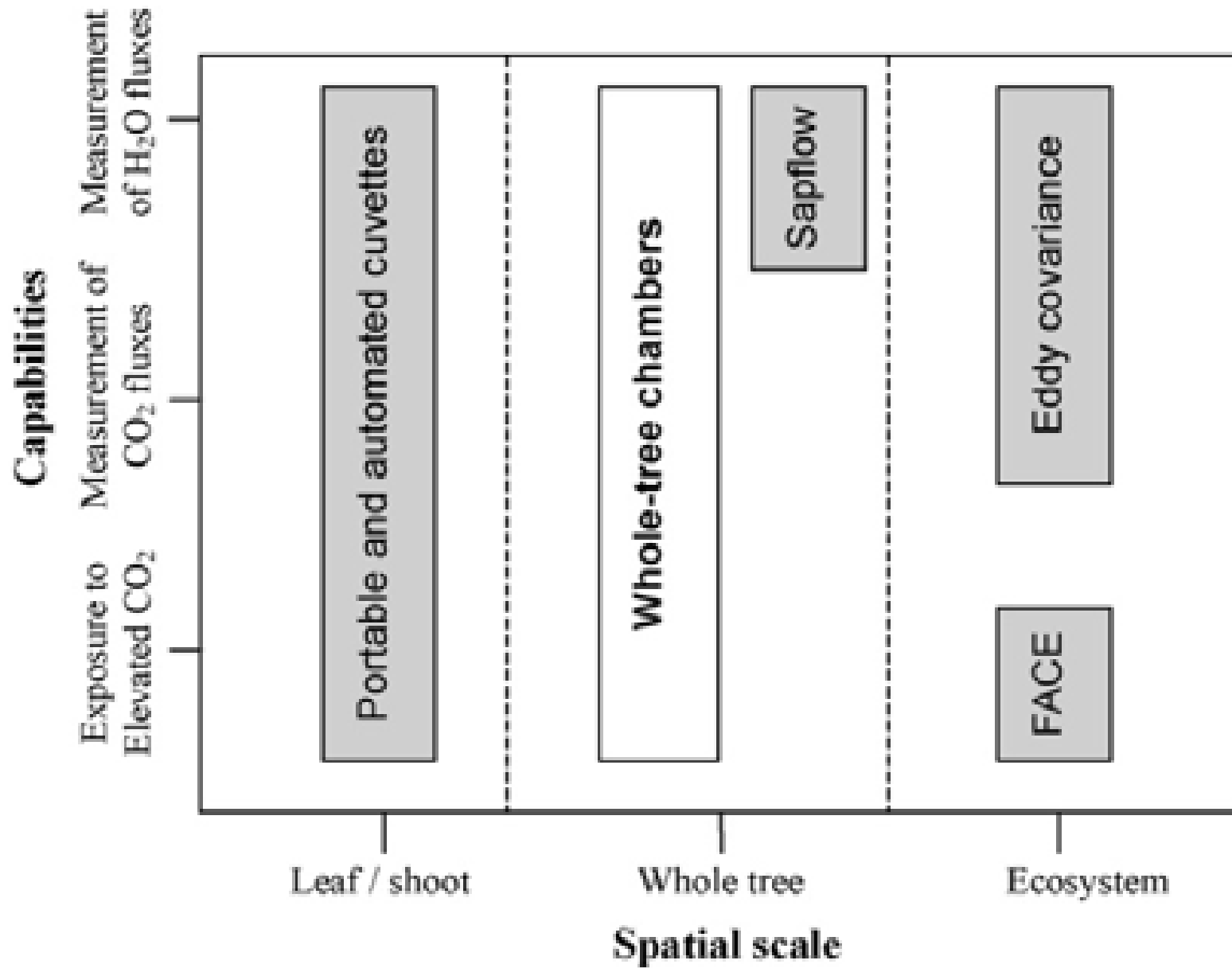
個体レベルでの光合成・蒸散応答

- ・スウェーデン(40年生のドイツウヒ)
- ・シドニー(ユーカリ)



Medhurst et al (2006, PCE)

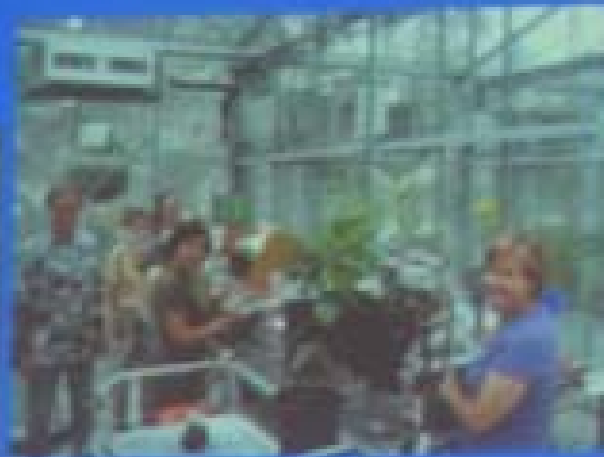
# 実験手法と対象スケール



# Prof. David Tissueの発表(温室実験)



Eucalypt Growth and Physiology in Past and Future Environments  
Understanding the Impacts of Atmospheric CO<sub>2</sub> and Temperature



Glasshouse Experiment



CO<sub>2</sub> - Sub-ambient (280 ppm); Ambient (400 ppm); Elevated (640 ppm)

Temperature - Ambient; Ambient + 4°C

Nutrients - Field soil with initial fertilisation

Water - Well Watered

Tree Species - *E. saligna* and *E. sideroxylon*

# 青空ポスターセッション



# 小エクスカーション



# 移動日(フォールスクリーク→メルボルン→タスマニア)





# タラリアでの滞在の様子



12日 カンファレンス

13日 エクスカーション

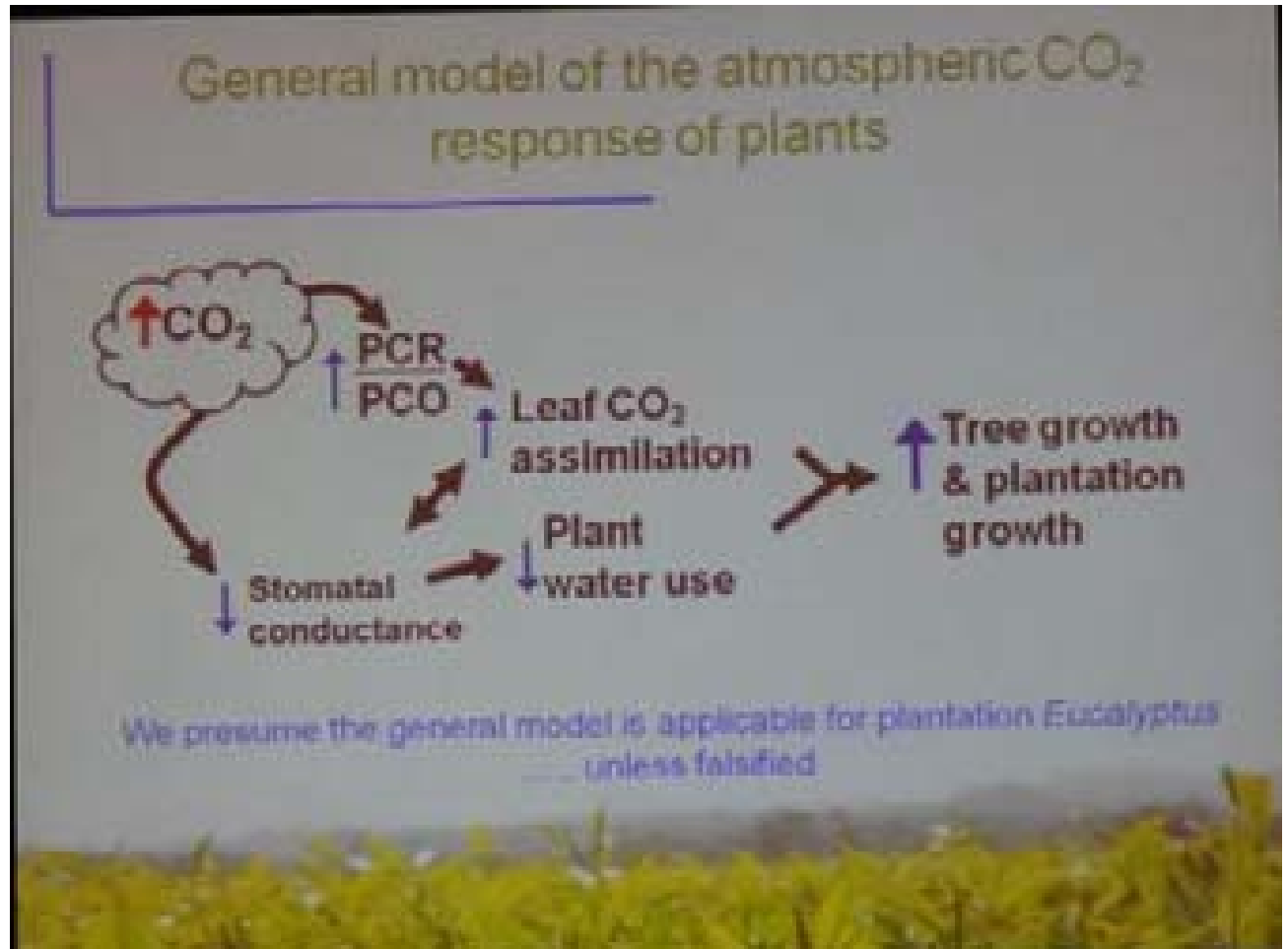
14日 カンファレンス



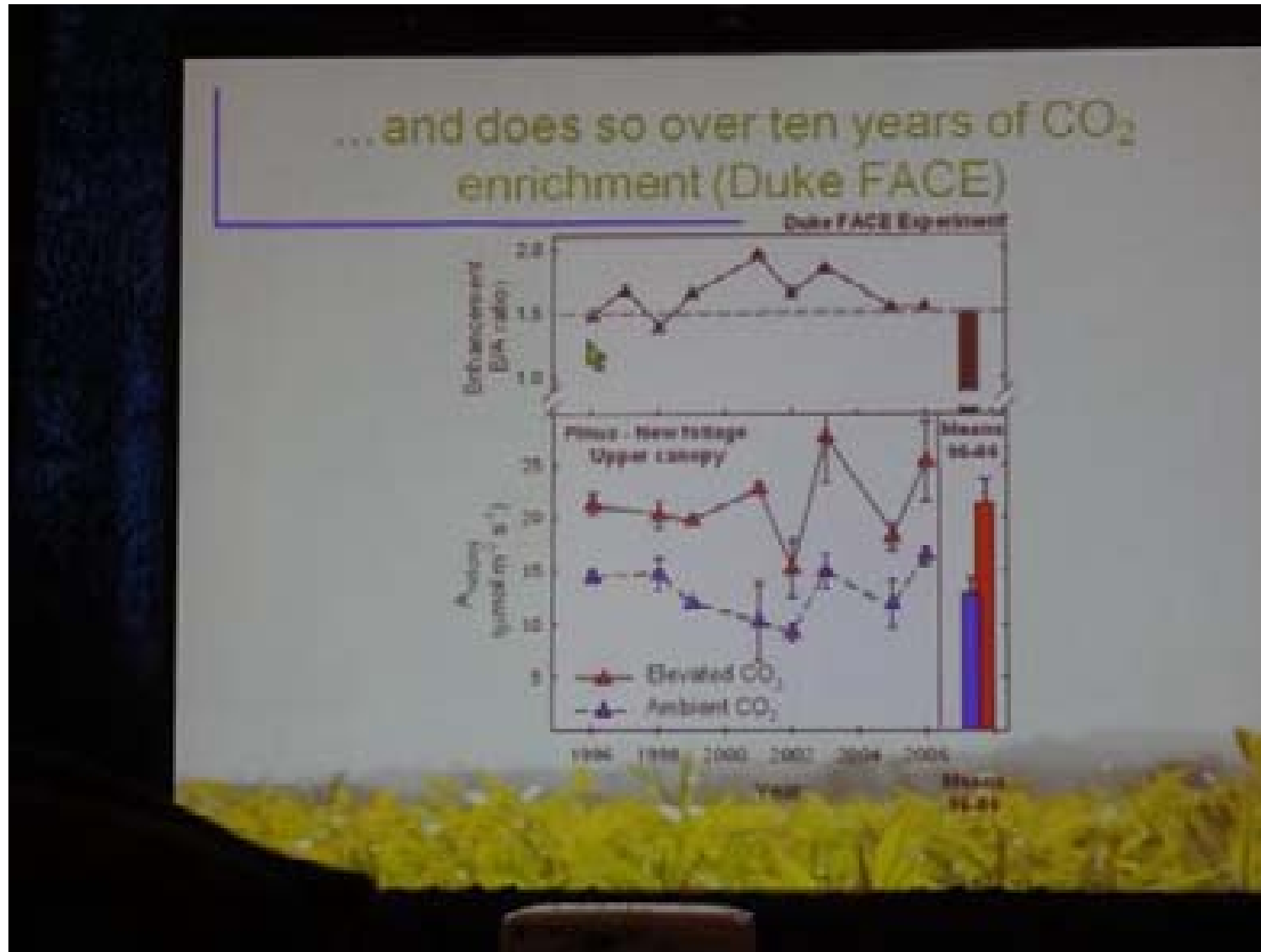
# タラリアでのセッションテーマ

- Theme 3:  
Land and atmosphere exchanges from the leaf to the region
- Theme 4:  
Emerging technologies and approaches-  
the canopy processes toolkit
- Theme 5:  
Prediction and uncertainty in mechanistic  
models of forest canopies

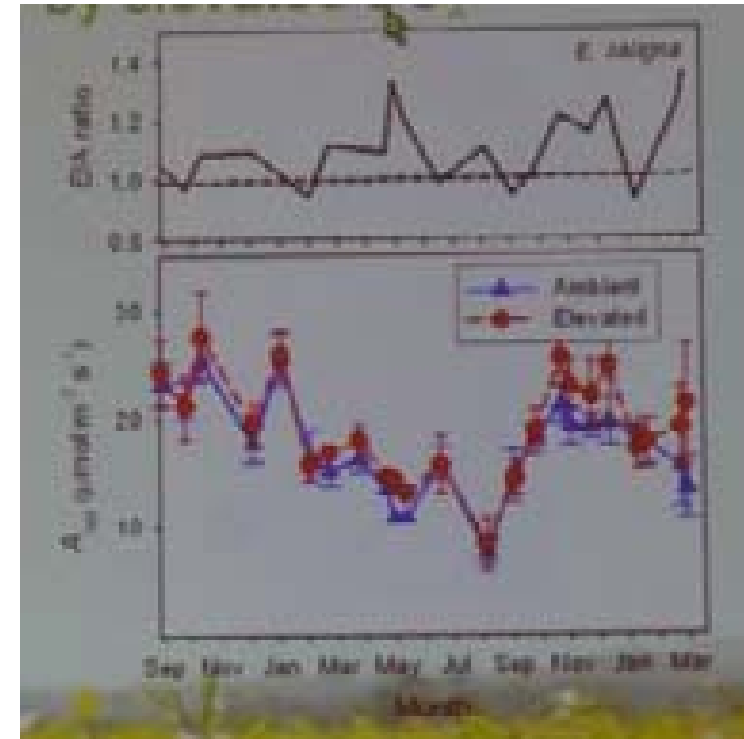
# Prof. David Ellsworthの発表(WTC)



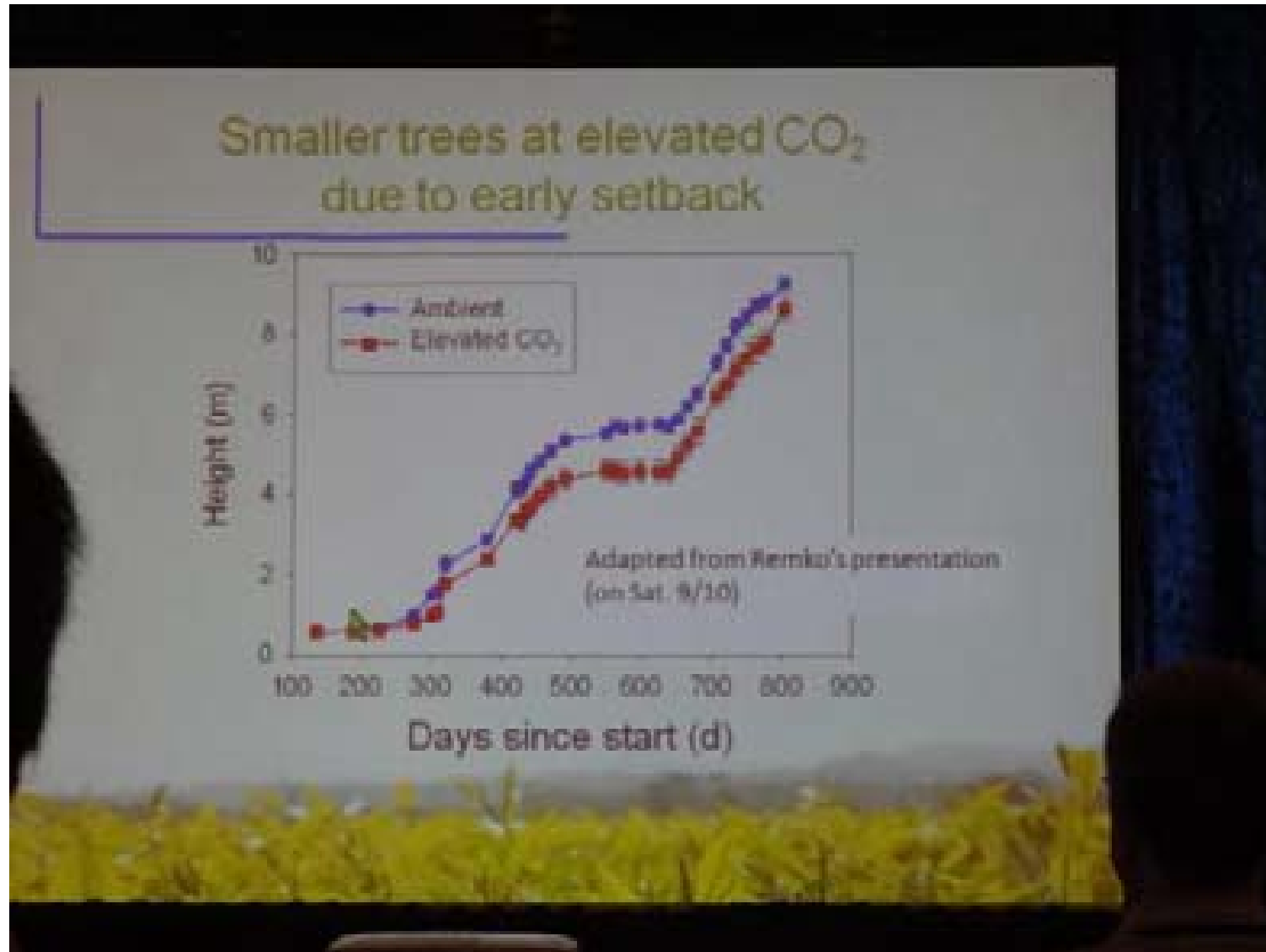
# Prof. David Ellsworthの発表(WTC)



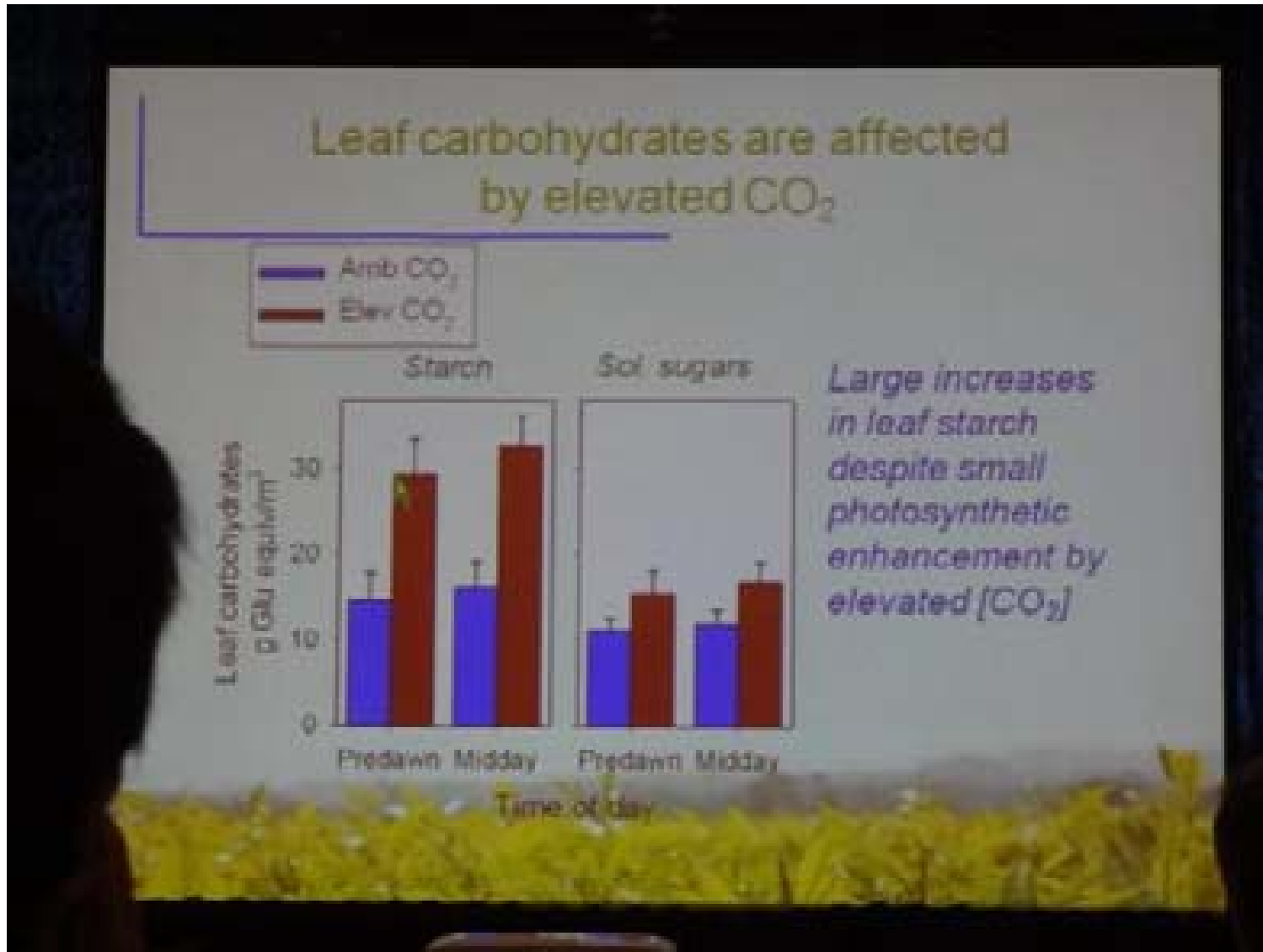
# Prof. David Ellsworthの発表(WTC)



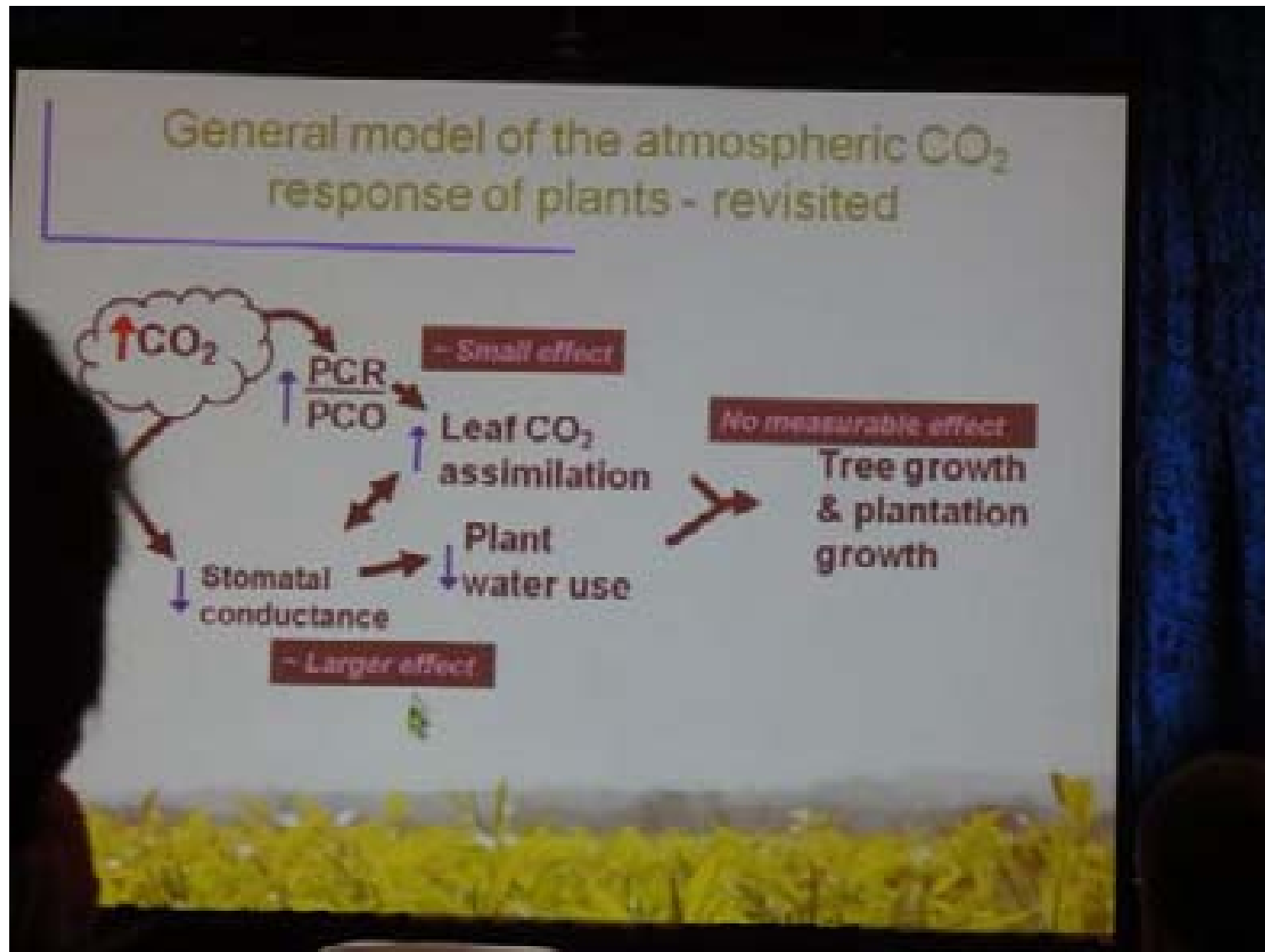
# Prof. David Ellsworthの発表(WTC)



# Prof. David Ellsworthの発表(WTC)

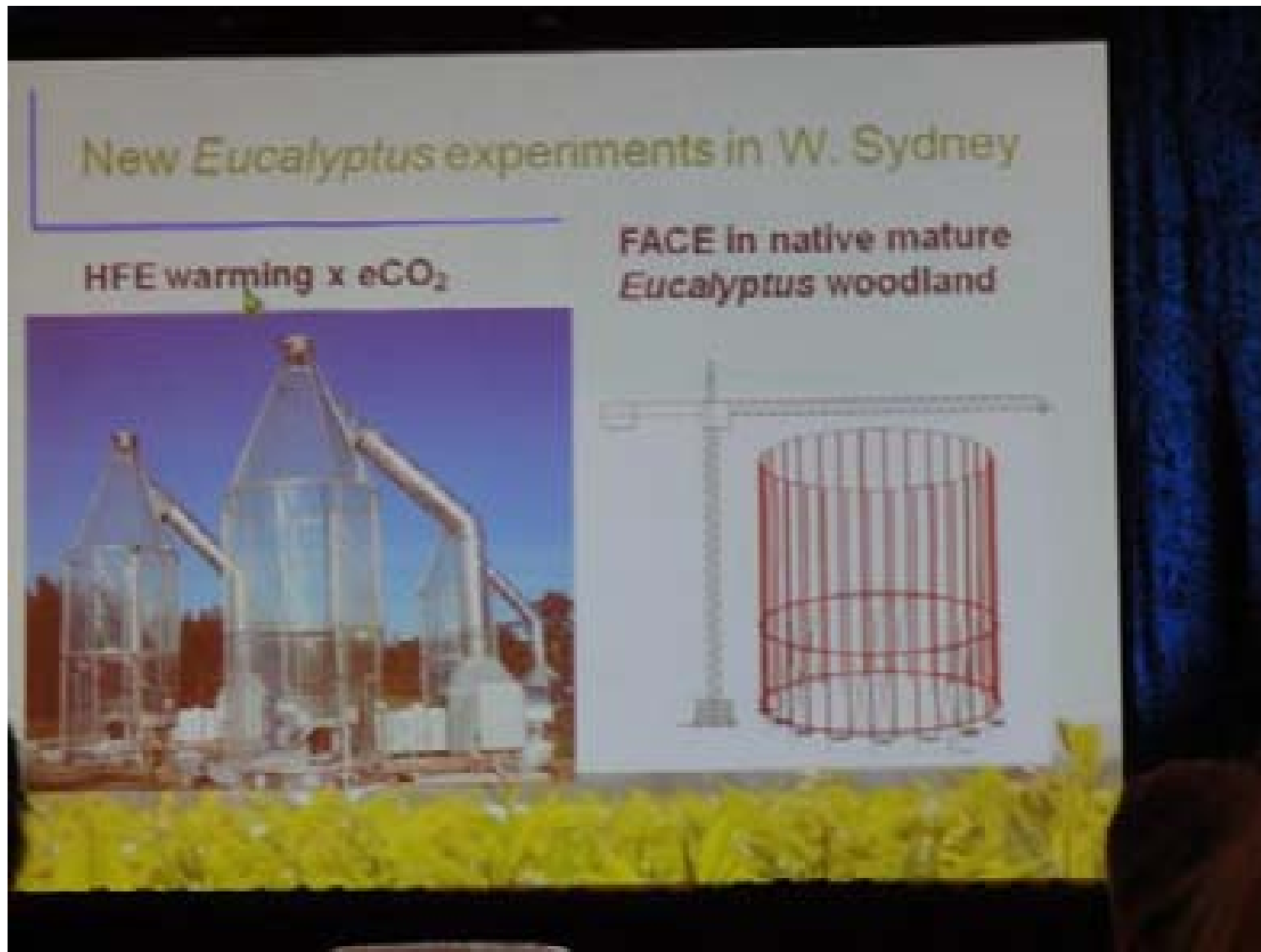


# Prof. David Ellsworthの発表(WTC)





# オーストラリアで新しいFACE実験



# エクスカージョン



# エクスカージョン2



# エクスカージョン3



# タラリアでのトレッキング



ウォンバット

# 最終日（移動日）

タラリア10/15 9:00発

→ホーバート

→メルボルン

→シドニー

→成田

→新千歳 10/16 12:45着



# おしまい(飛行機より)

