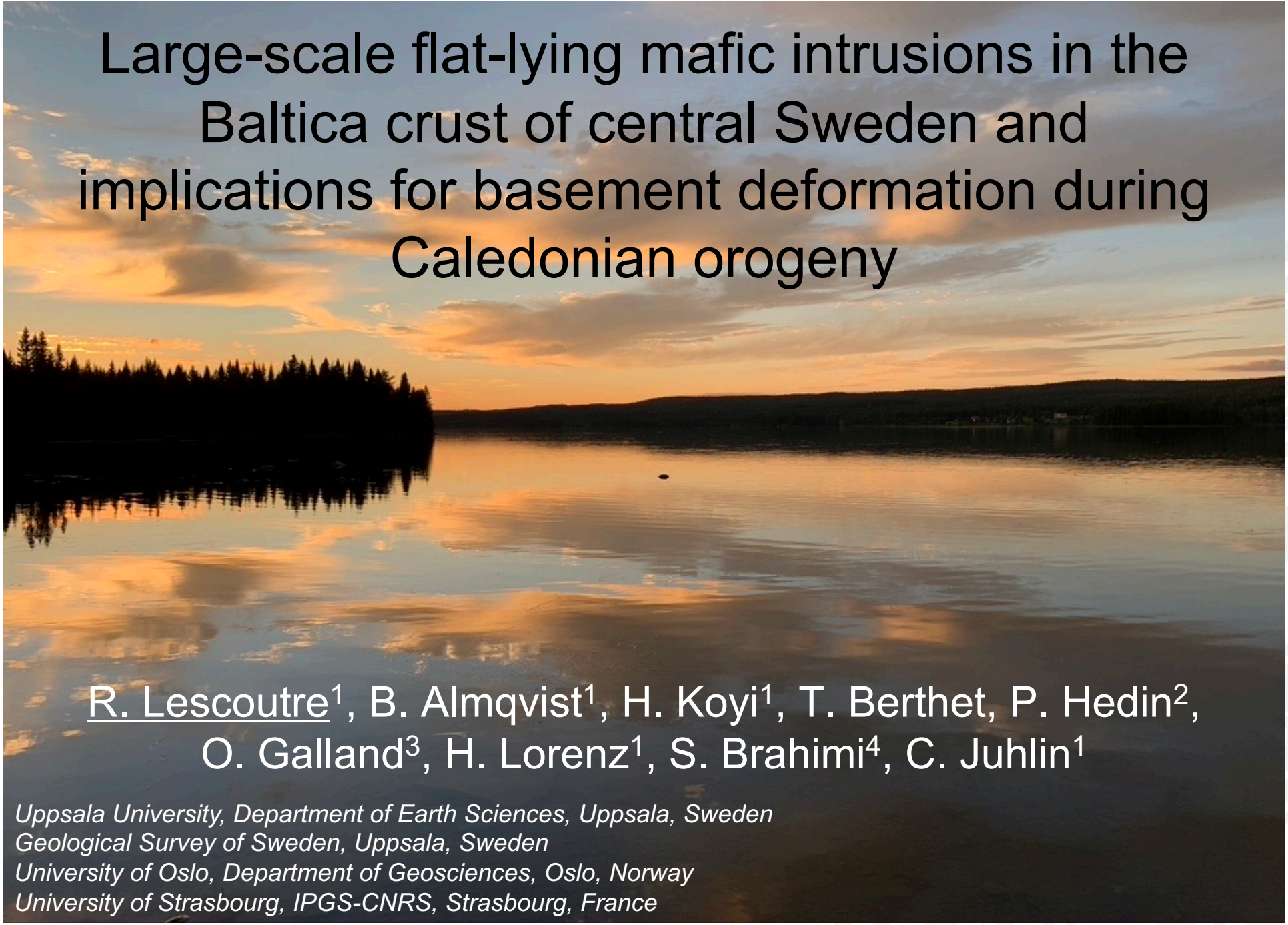
# Large-scale flat-lying mafic intrusions in the Baltica crust of central Sweden and implications for basement deformation during Caledonian orogeny



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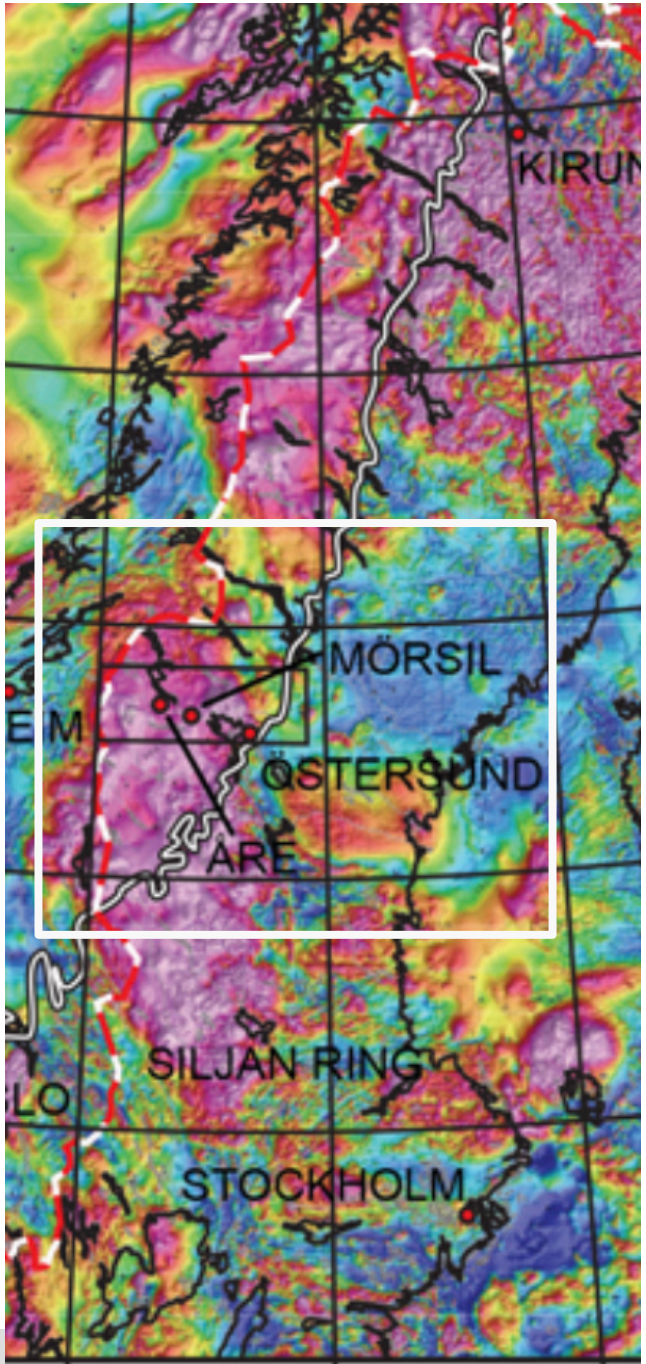
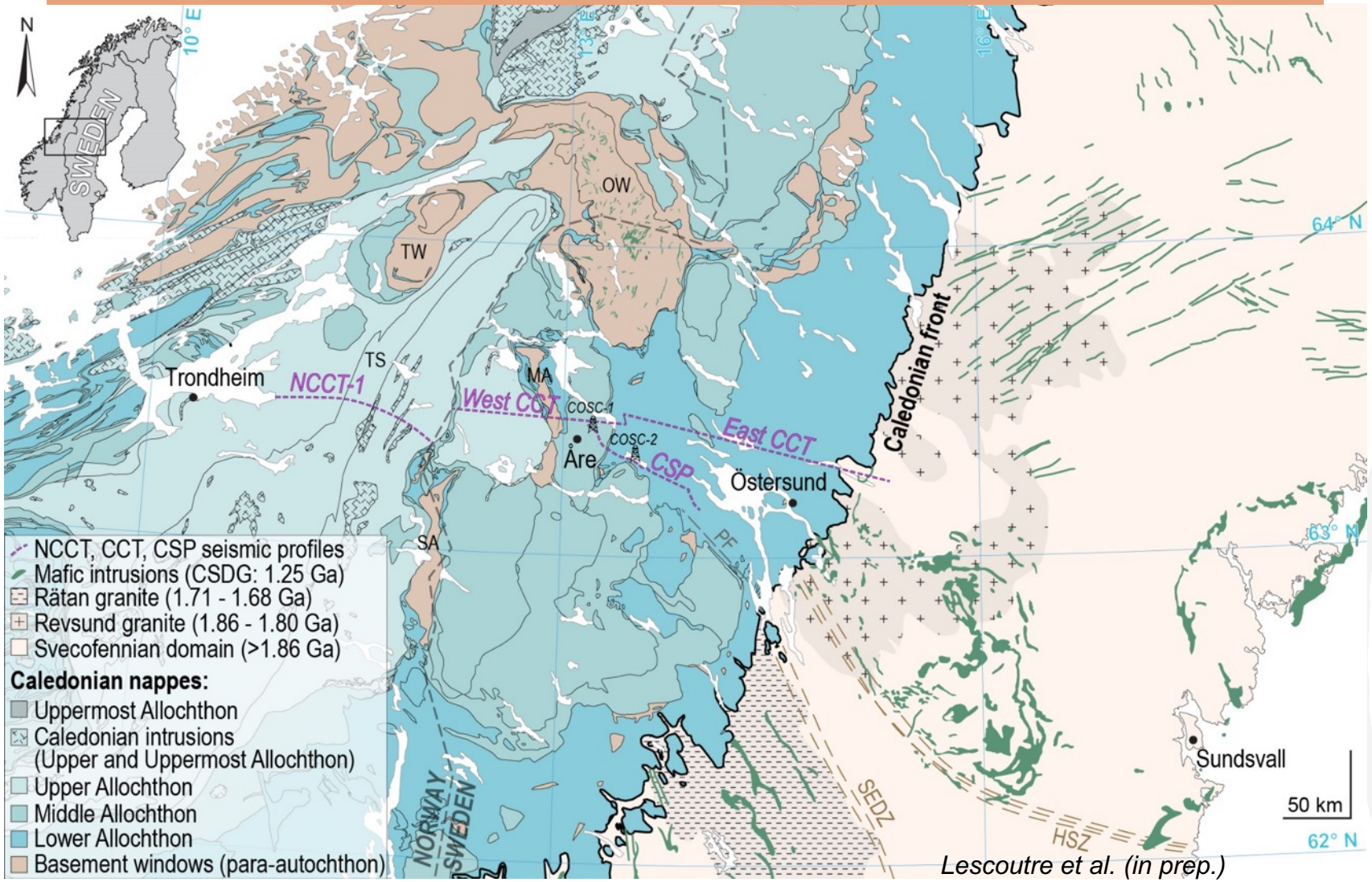


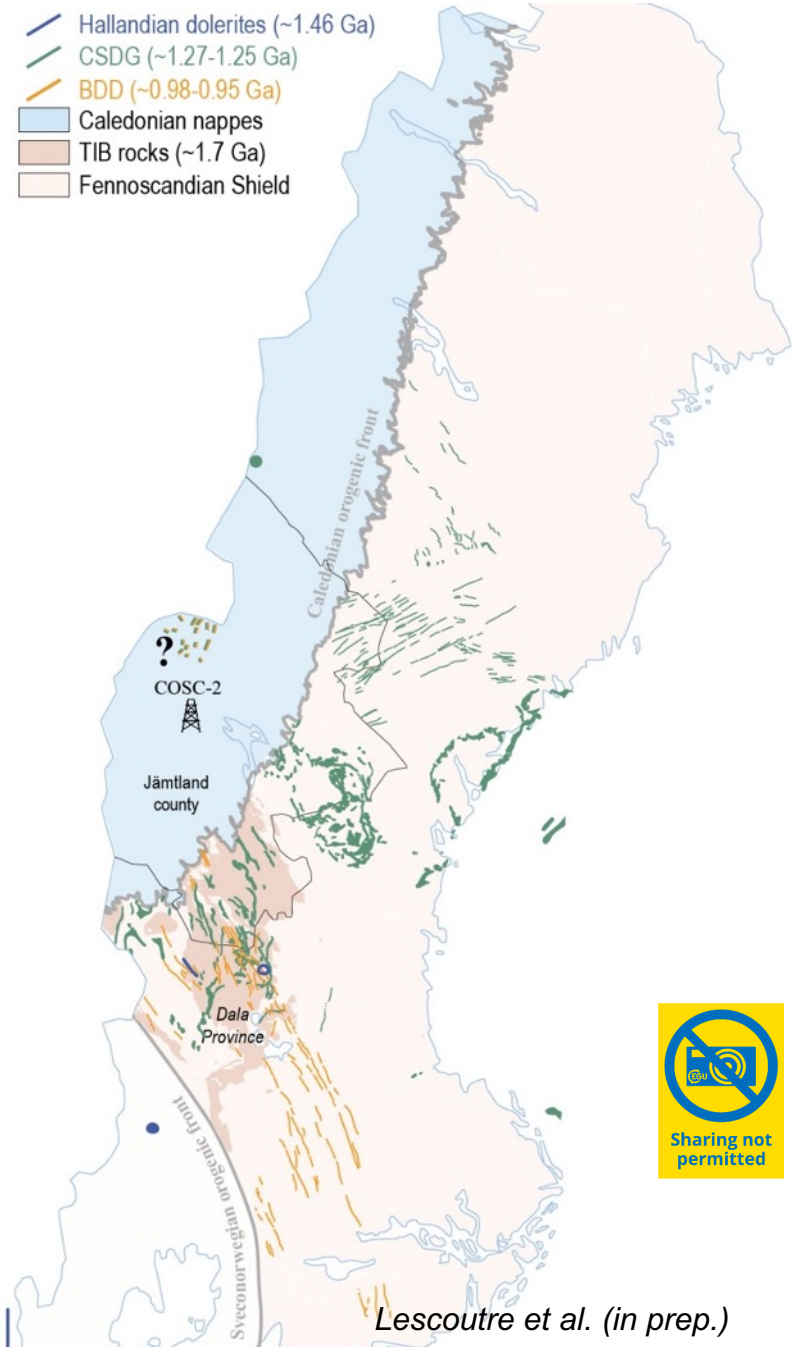

Hedin et al. (2014)


Lescoutre et al. (in prep.)

*Architecture of the basement underneath the Caledonian nappes?*
*Distribution of the deformation in the basement?*
*Role of inheritance in localising deformation?*

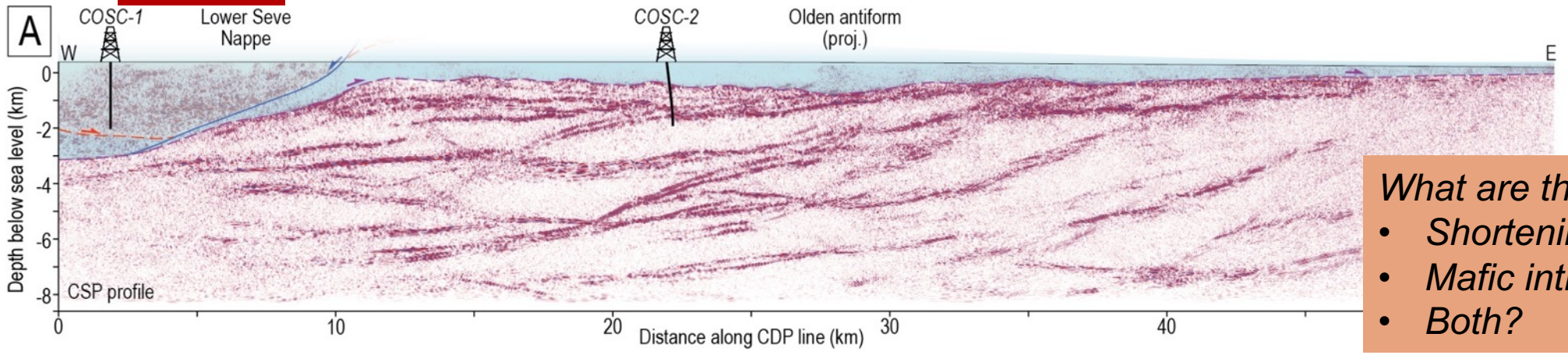



*Lescoutre et al. (in prep.)*



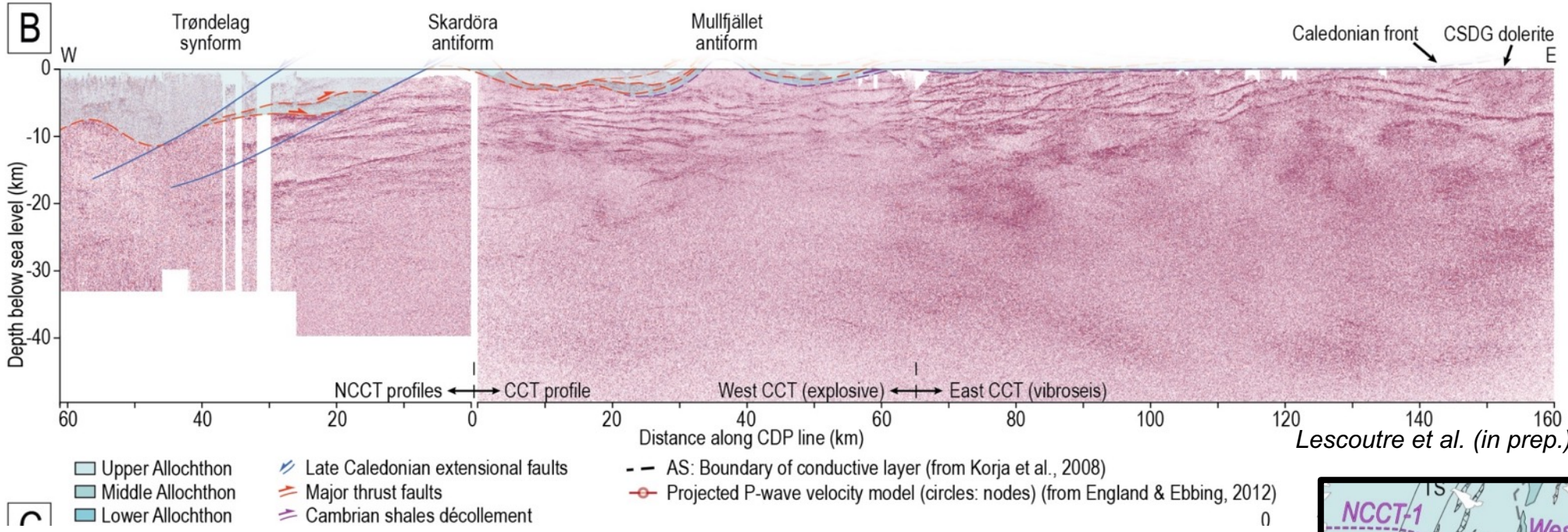



*Lescoutre et al. (in prep.)*



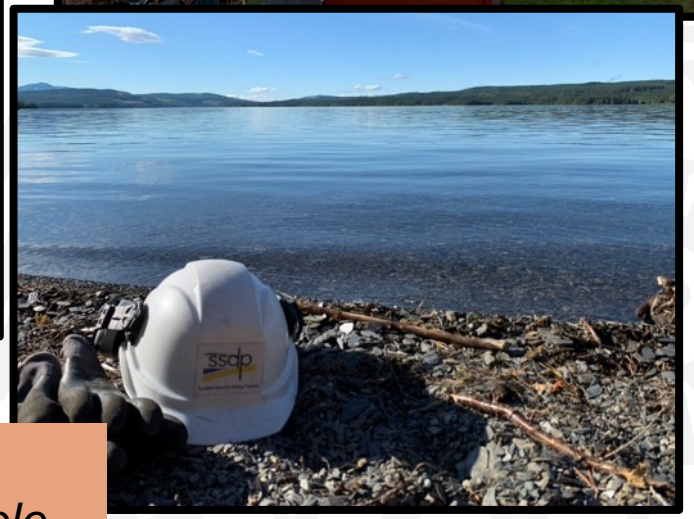

*What are these seismic reflectors?*

- *Shortening-induced deformation?*
- *Mafic intrusions?*
- *Both?*




*Lescoutre et al. (in prep.)*

# COSC-2 drill site - Järpen



- ✓ *April - August 2020*
- ✓ *2276 m deep borehole*
- ✓ *100% core recovery*

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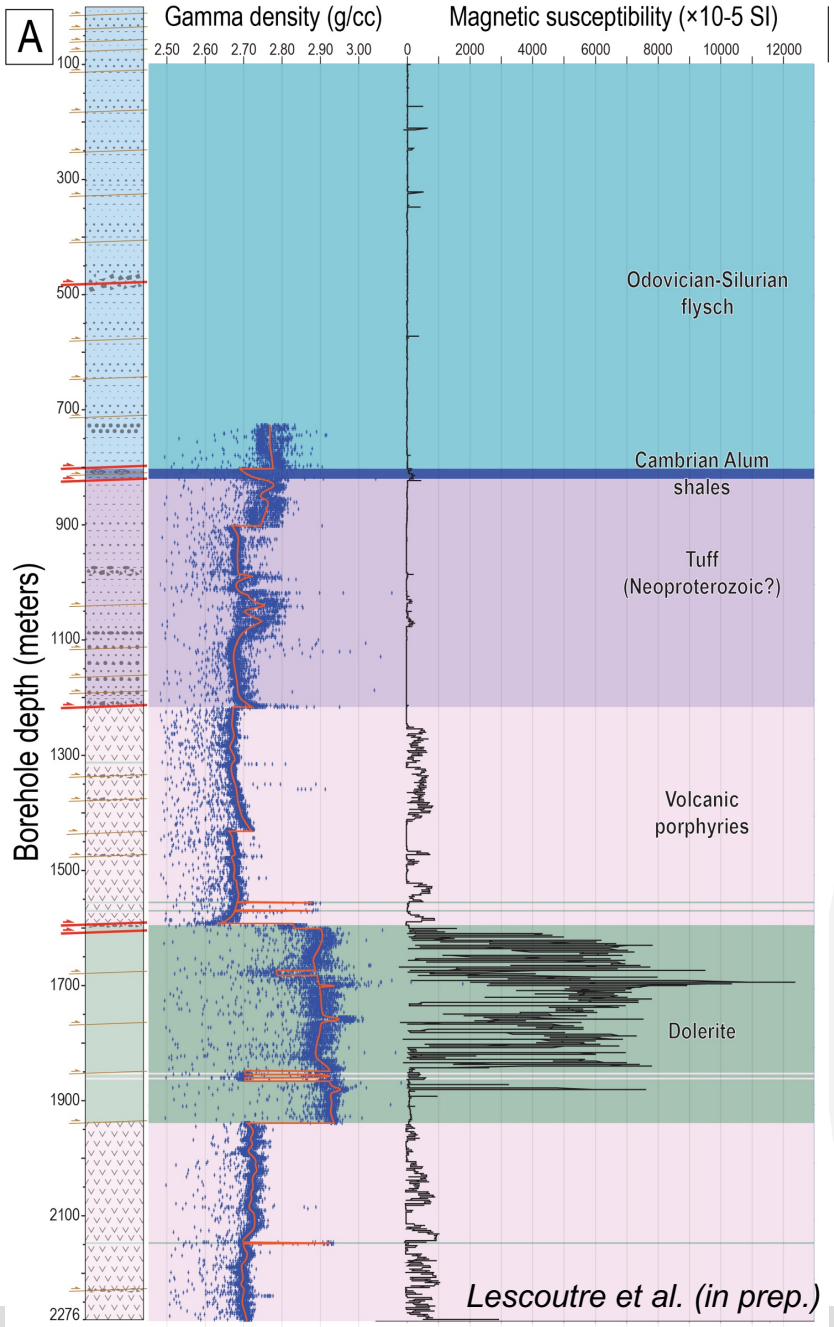
Ordovician-Silurian flyschs

Cambrian Alum shales

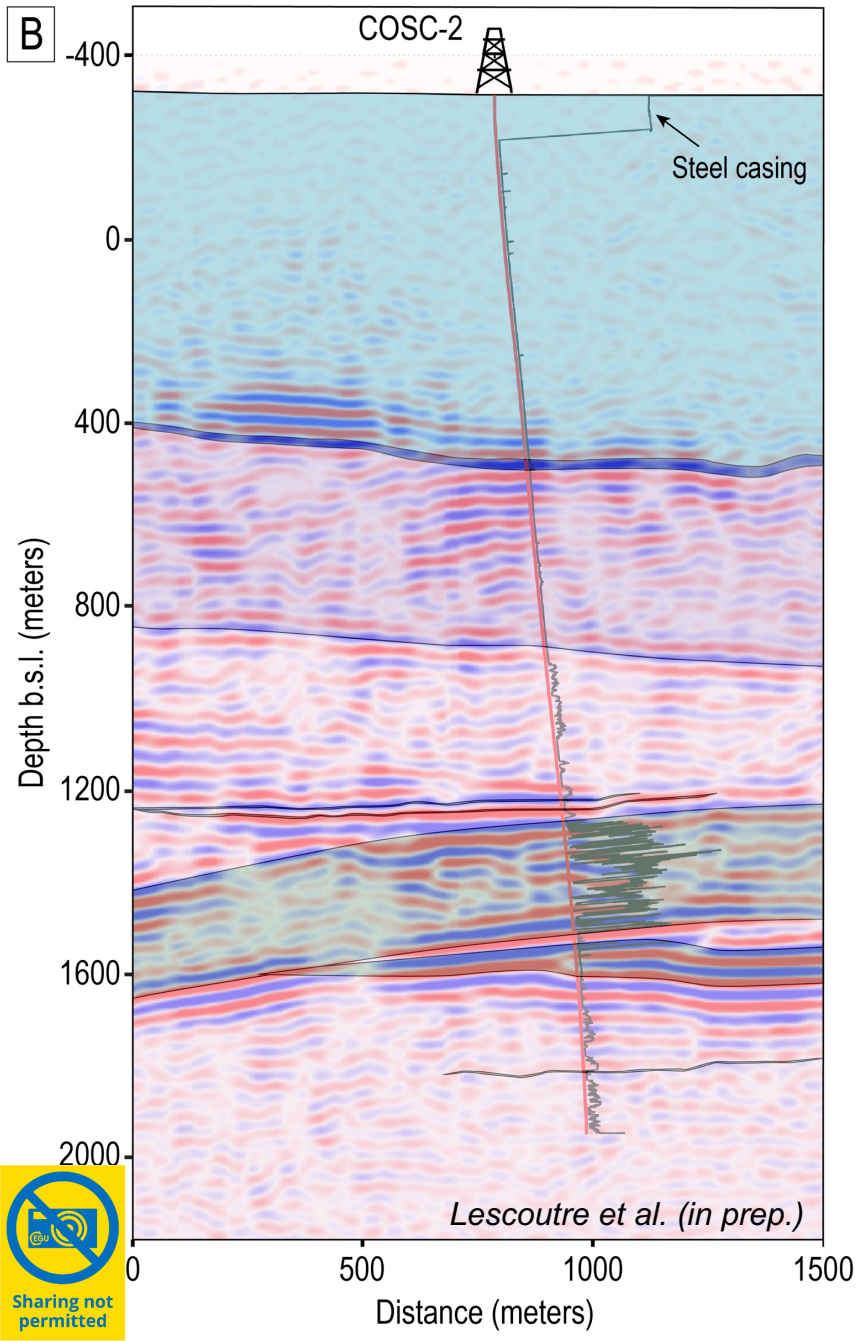
Neoproterozoic (?) tuffs

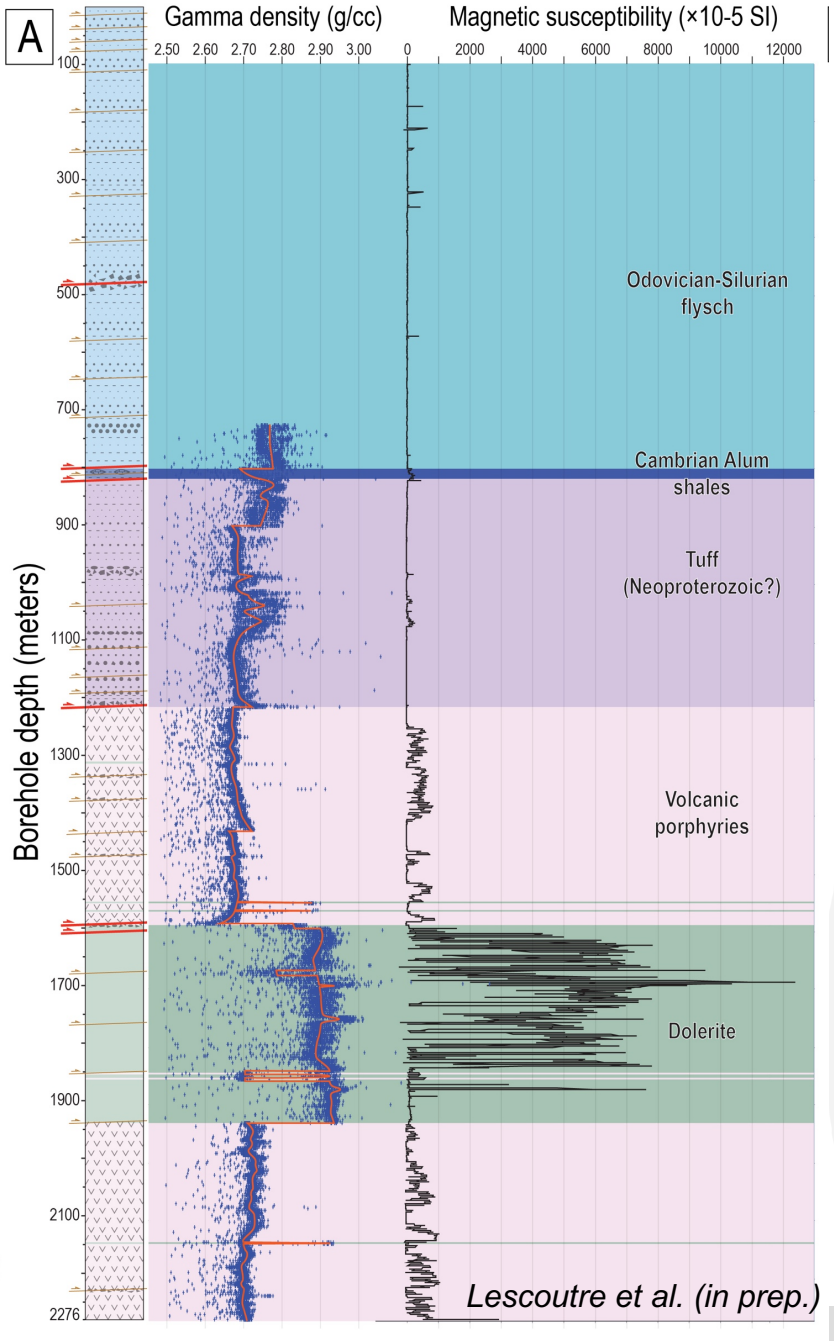
Volcanic porphyries

Dolerites

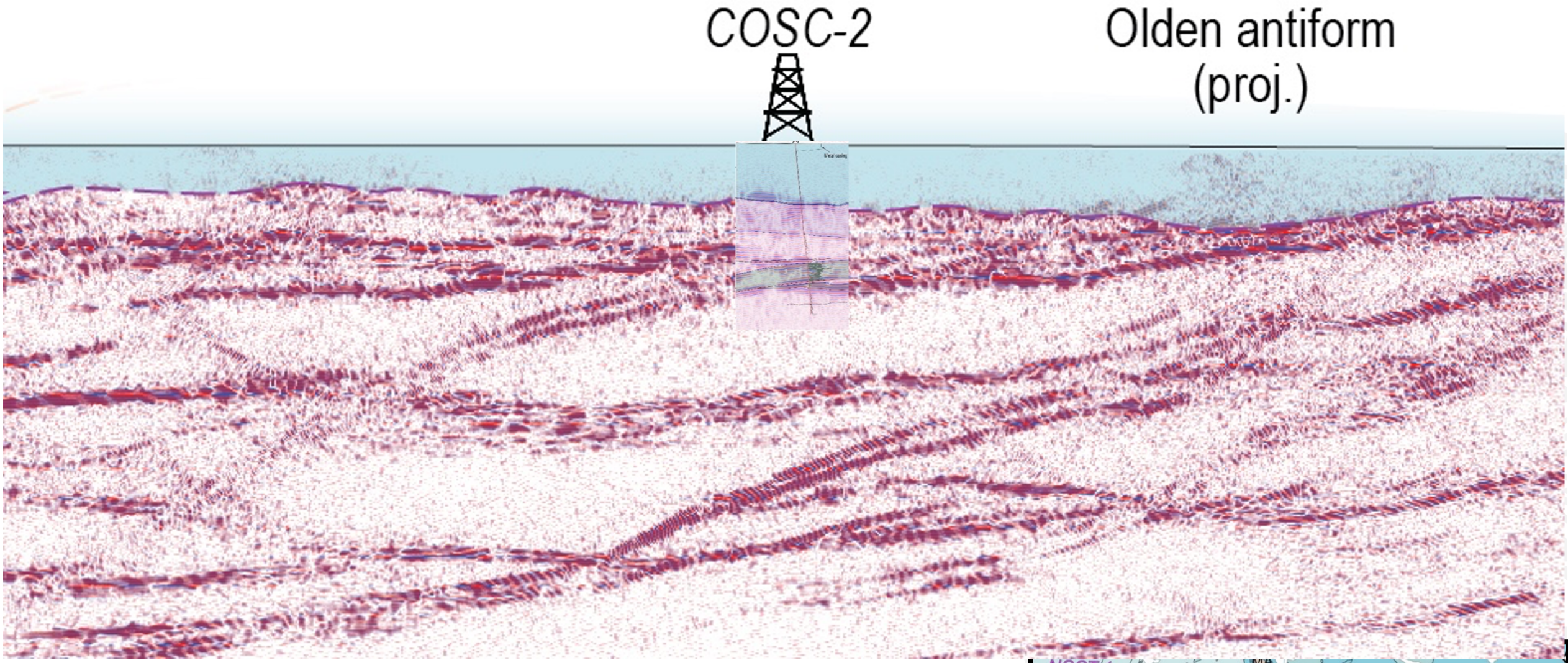



- ✓ *Dolerites: high magnetic susceptibility and high density*
- ✓ *Porphyries: lower magnetic susceptibility and density*

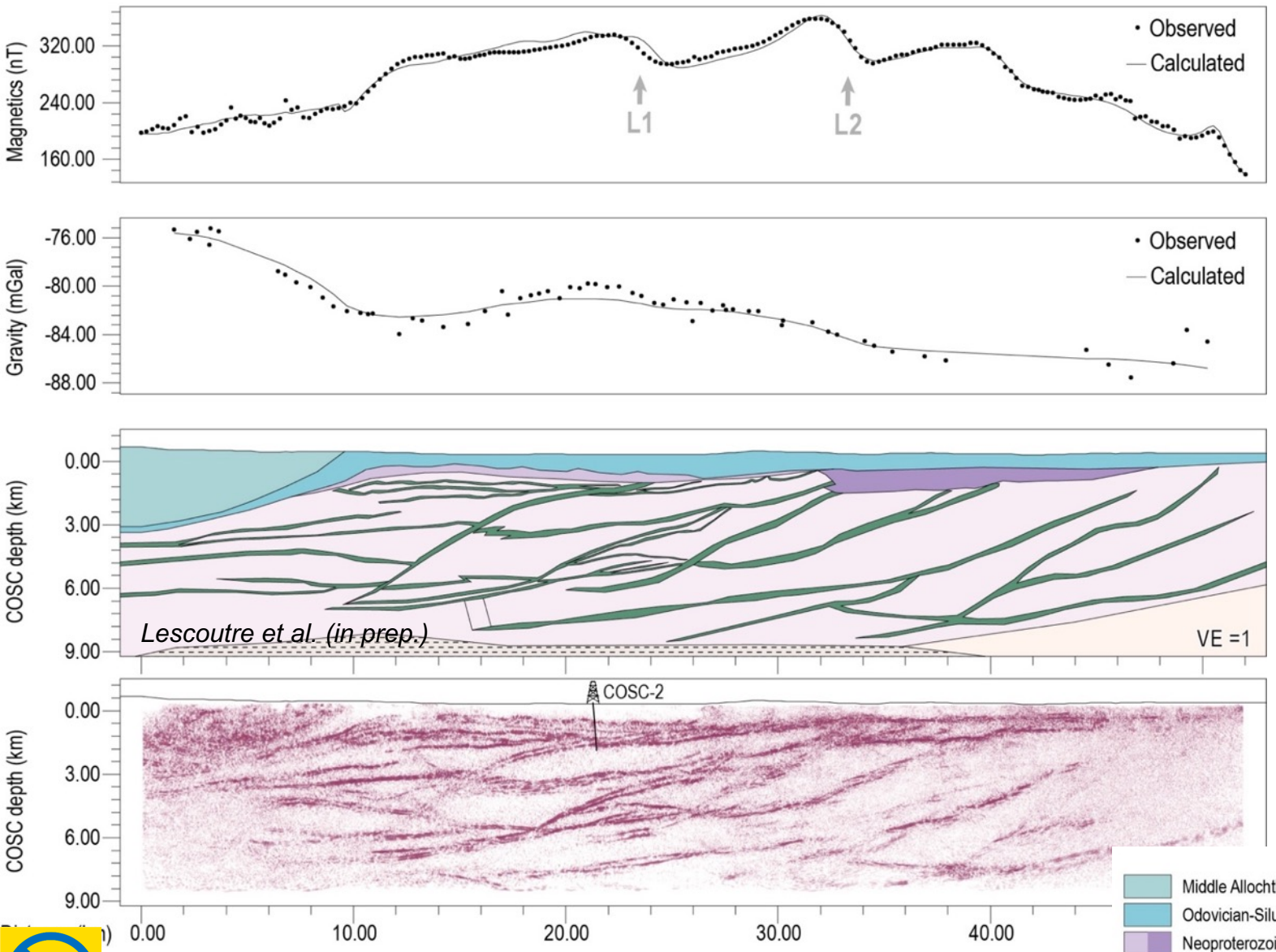



- ✓ *Dolerites: high magnetic susceptibility and high density*
- ✓ *Porphyries: lower magnetic susceptibility and density*
- ✓ *Lithological boundaries nicely correlate with major seismic reflectors*
- ✓ *Deformation along the margins of the thick (>240 m) dolerite*
- ✓ *Basement made of volcanic porphyries*




- *Are all the pervasive reflectors dolerites?*
- *What is their expression on potential field data?*




*~60 nT asymmetric magnetic anomaly and gravity anomaly associated to west-dipping dolerites*

New gravity data (acquired by T. Berthet)

| | Used magnetic susceptibility (SI) | Used density (kg/m³) |
|---|---|---|
| Middle Allochthon (Seve nappe) | 0.0001 | 2760 |
| Odovician-Silurian sedimentary cover | 0.0001 | 2760 |
| Neoproterozoic (?) basin | 0.001; 0.001 | 2690; 2650 |
| Dolerites | 0.05 | 2910 |
| Volcanic porphyries (TIB) | 0.002 | 2680 |
| Rätan granite (TIB) | 0.04 | 2730 |
| Unknown basement rocks (e.g. Svecofennian, Revsund, mafics) | 0.001 | 2720 |

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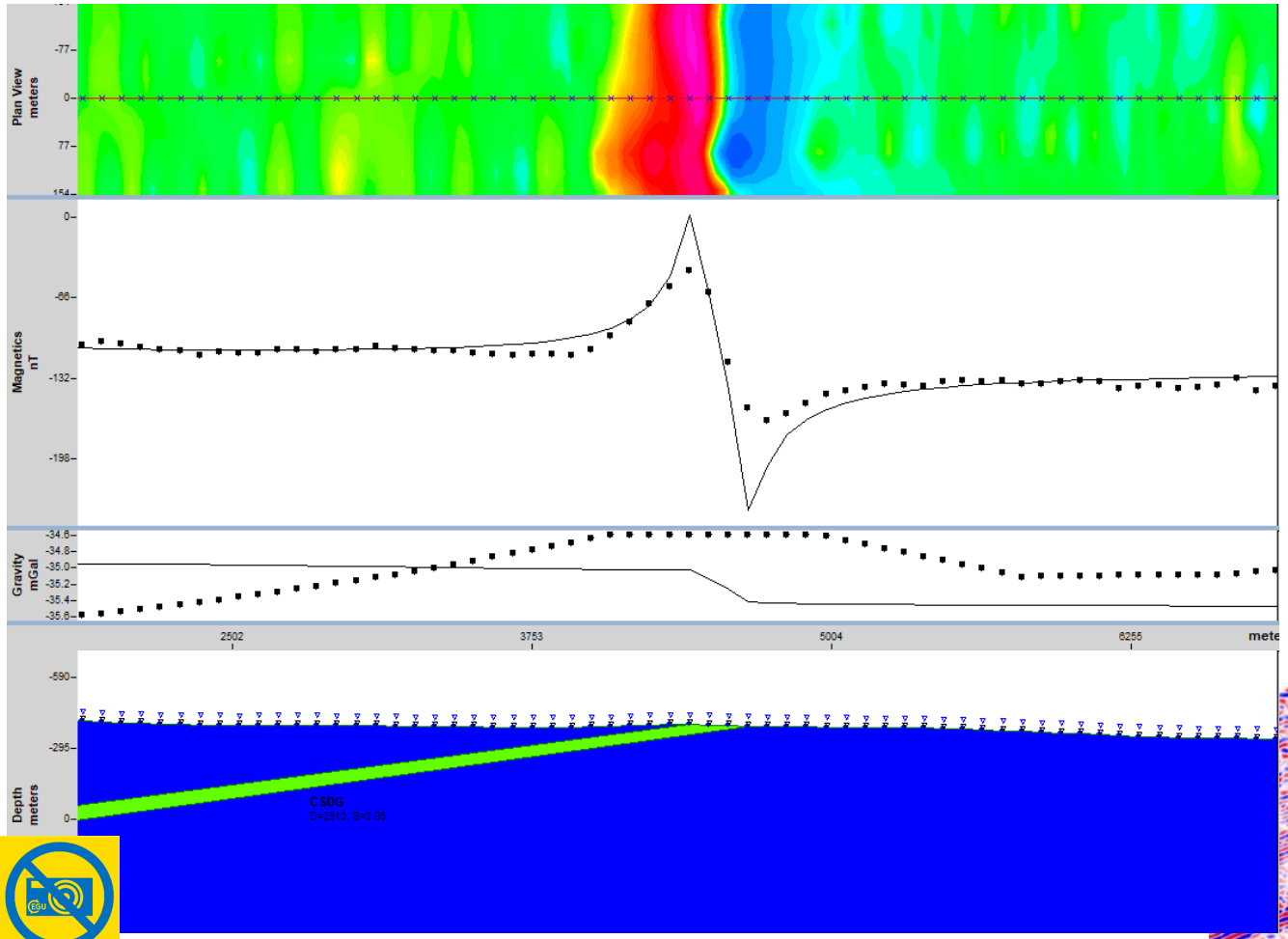
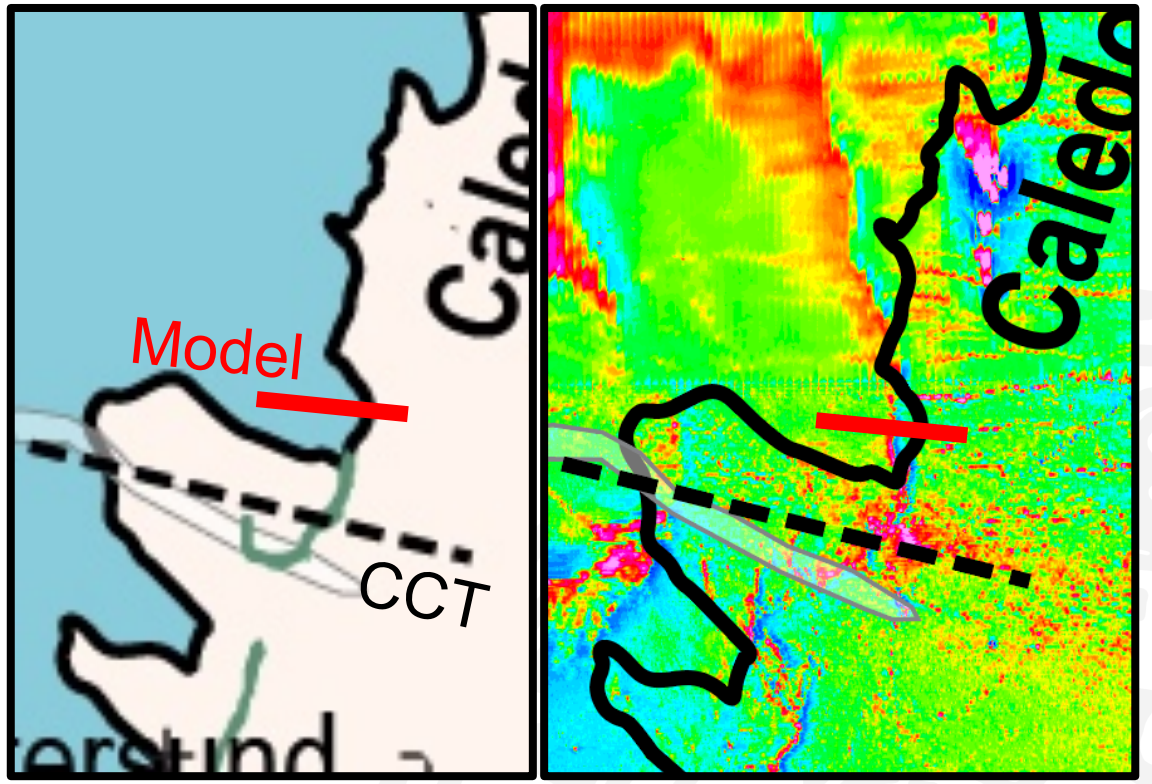
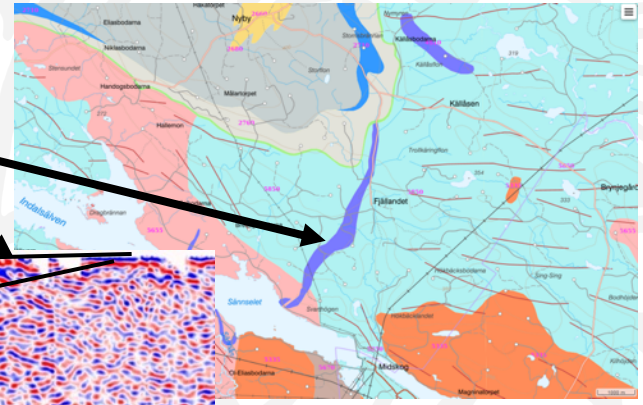
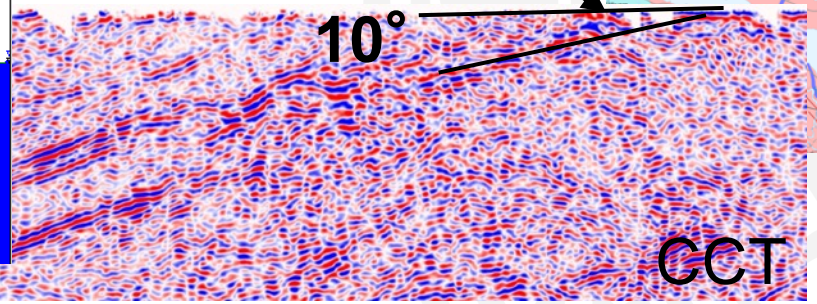
- 40 m thick dolerite
- Dipping W at 10˚
- Mag. Susc. = 0.05 SI



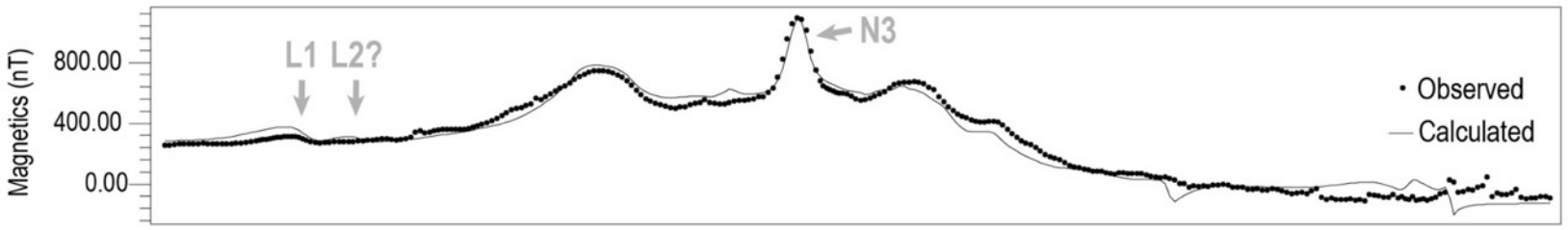



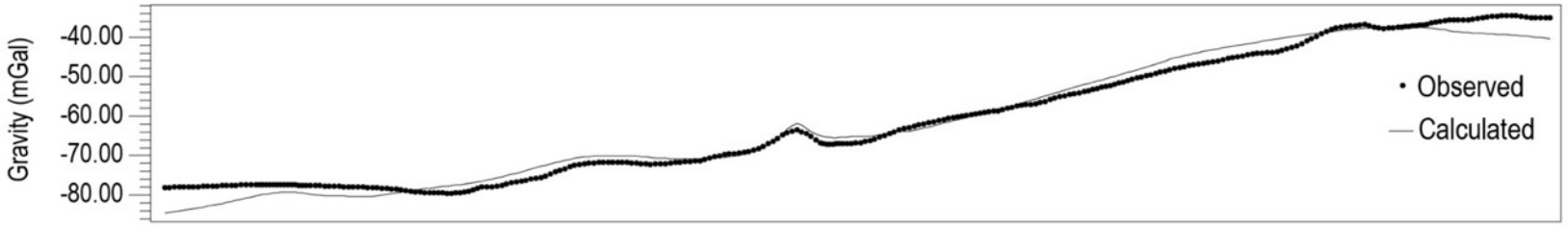



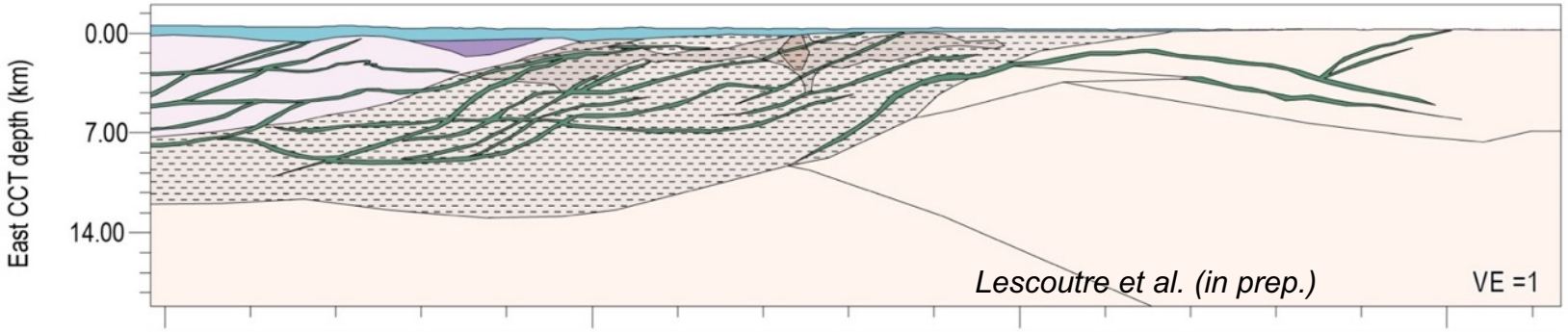
**CSDG dolerite**

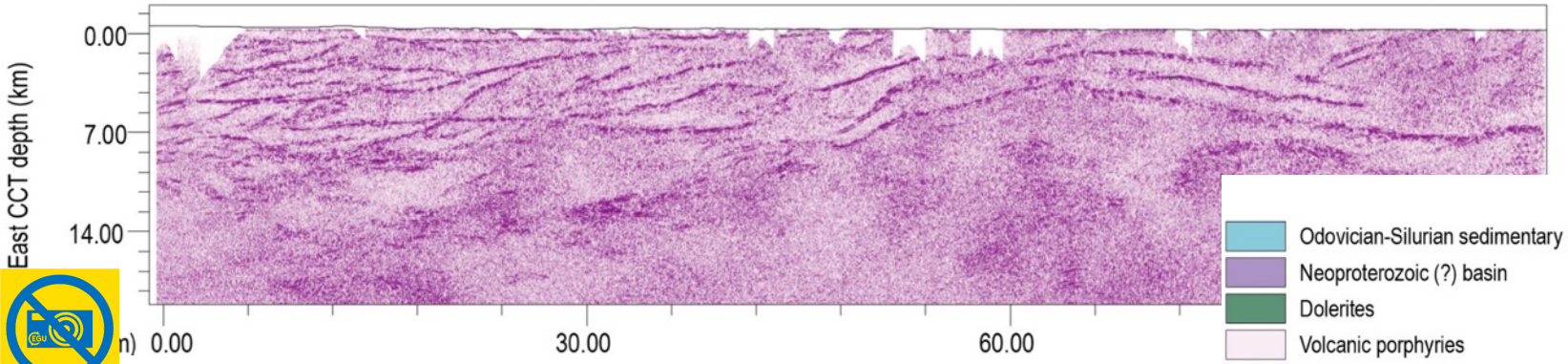


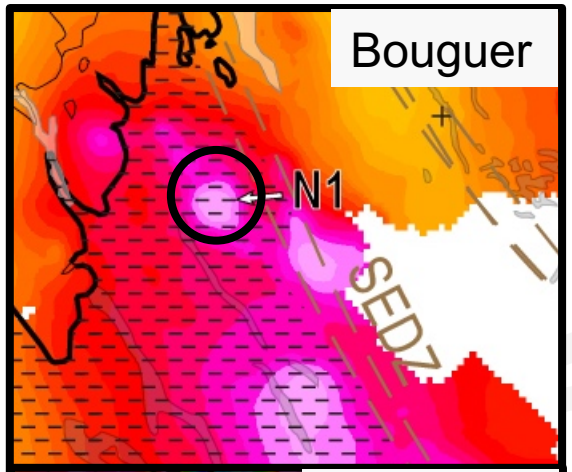

*Lescoutre et al. (in prep.)*

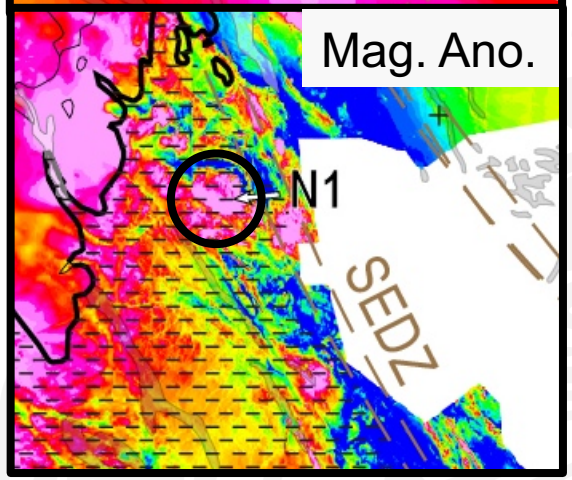


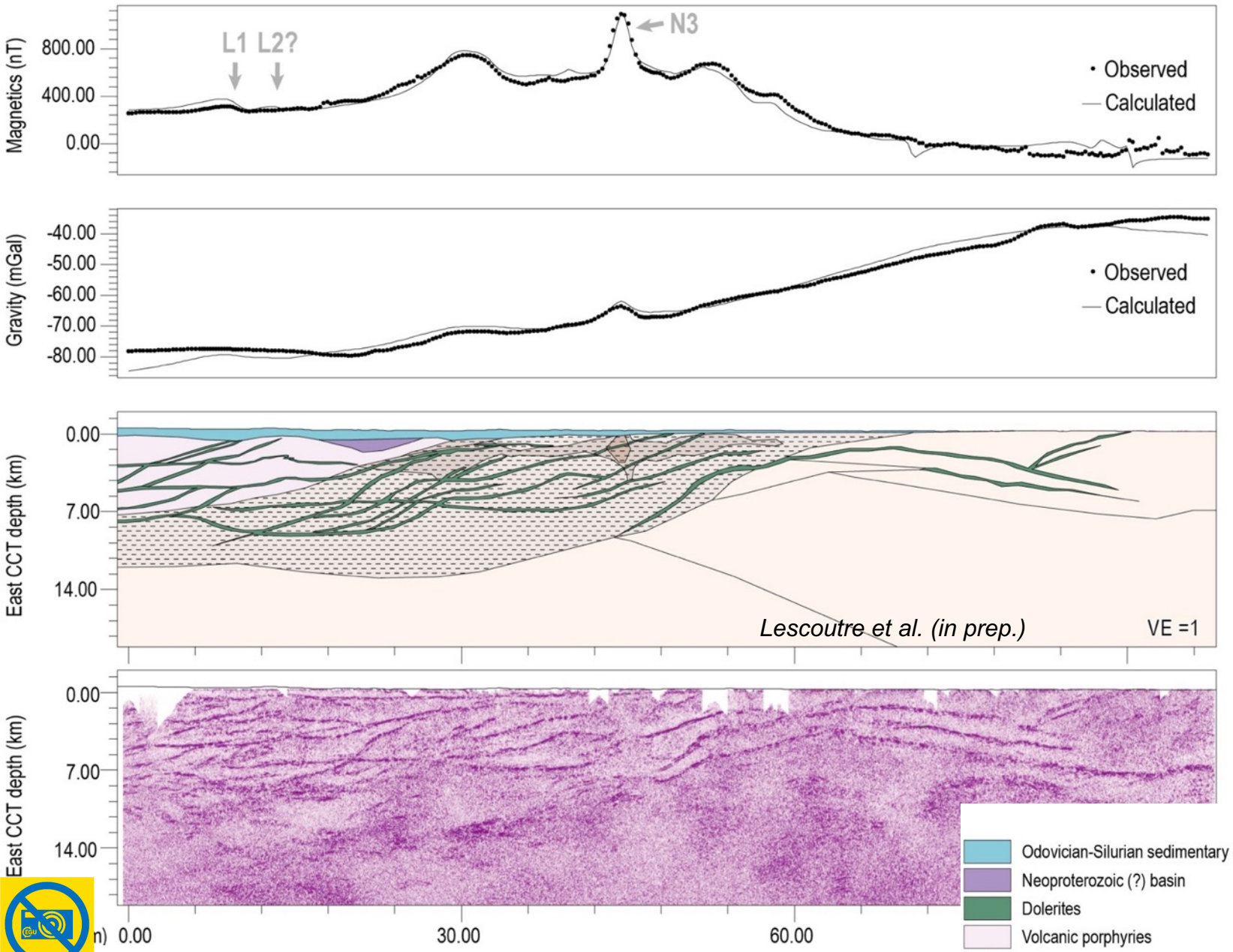




| | | Used magnetic susceptibility (SI) | Used density (kg/m³) |
|---|---|---|---|
| Odovician-Silurian sedimentary cover | | 0.0001 | 2760 |
| Neoproterozoic (?) basin | | 0.001 | 2650 |
| Dolerites | | 0.05 | 2910 |
| Volcanic porphyries | (TIB) | 0.002 | 2680 |
| Rätan granite (3 types) | (TIB) | 0.04; 0.06; 0.1 | 2730; 2730; 3000 |
| Unknown basement rocks (e.g. Svecofennian, Revsund, mafics) | | 0.001 - 0.04 | 2710 - 2800 |

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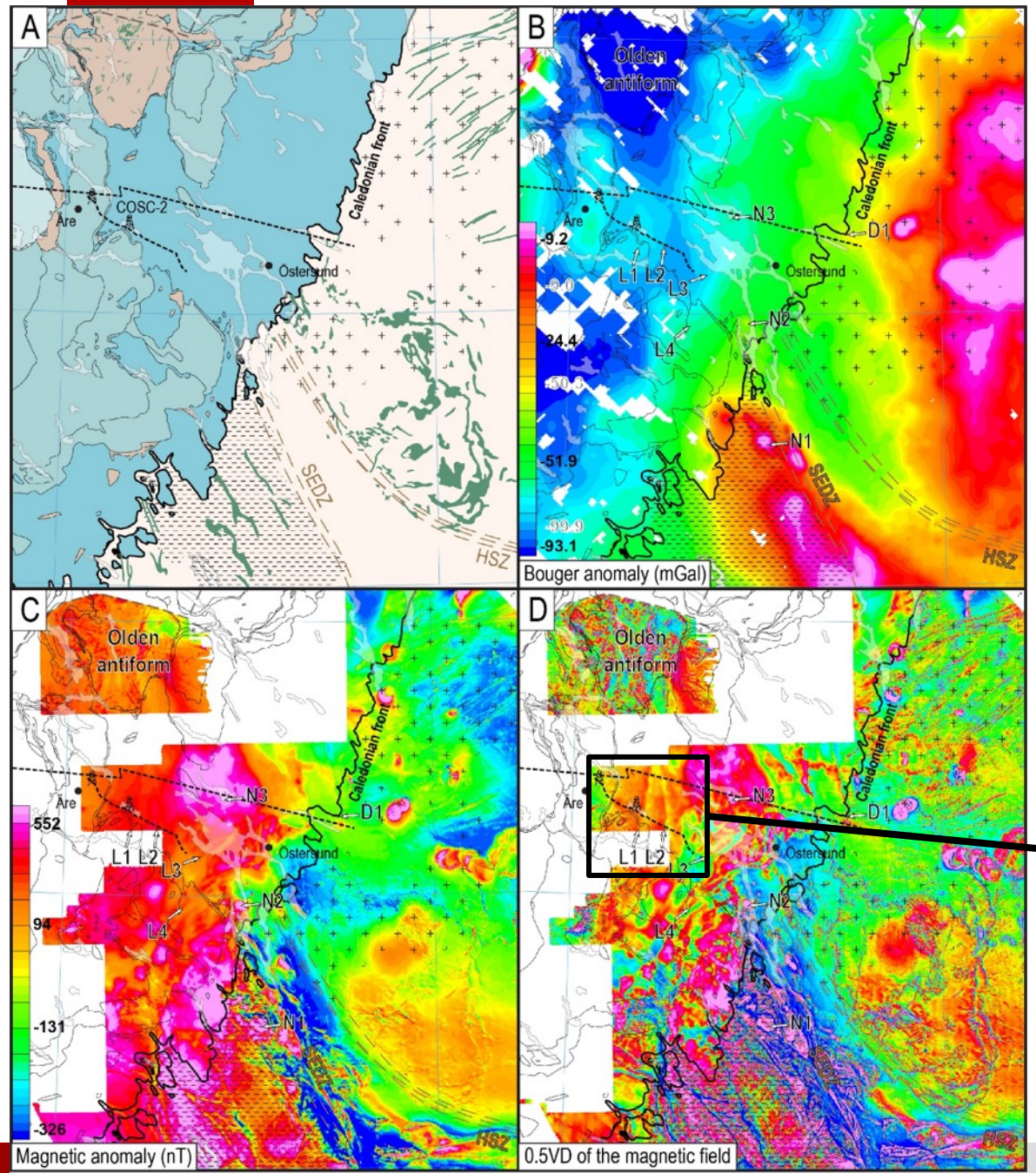
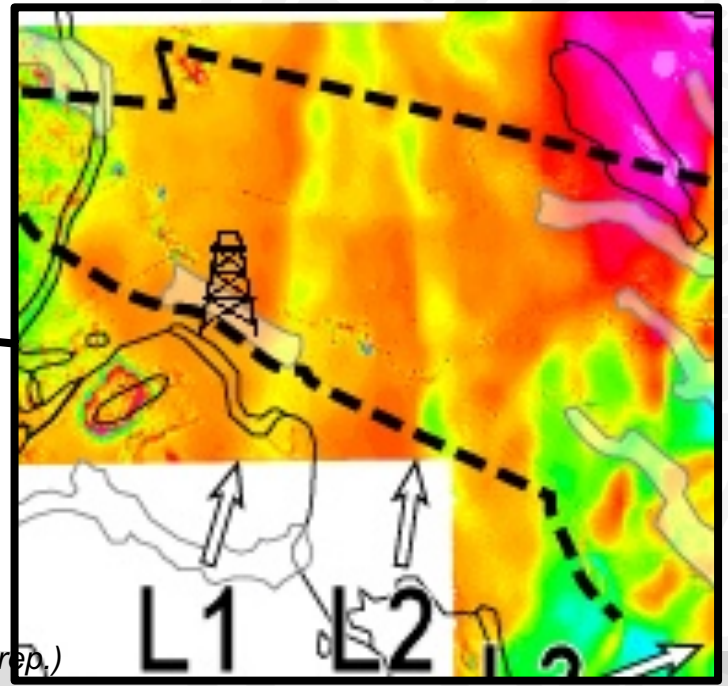
| Unknown basement rocks (e.g. Svecofennian, Revsund, mafics) | | 0.001 - 0.04 | 2710 - 2800 |

- *Very high and symmetric magnetic and gravity anomaly*
  *-> Monzogabbros in Rätan granite*
- *~60 nT asymmetric magnetic anomaly associated to west-dipping dolerites*

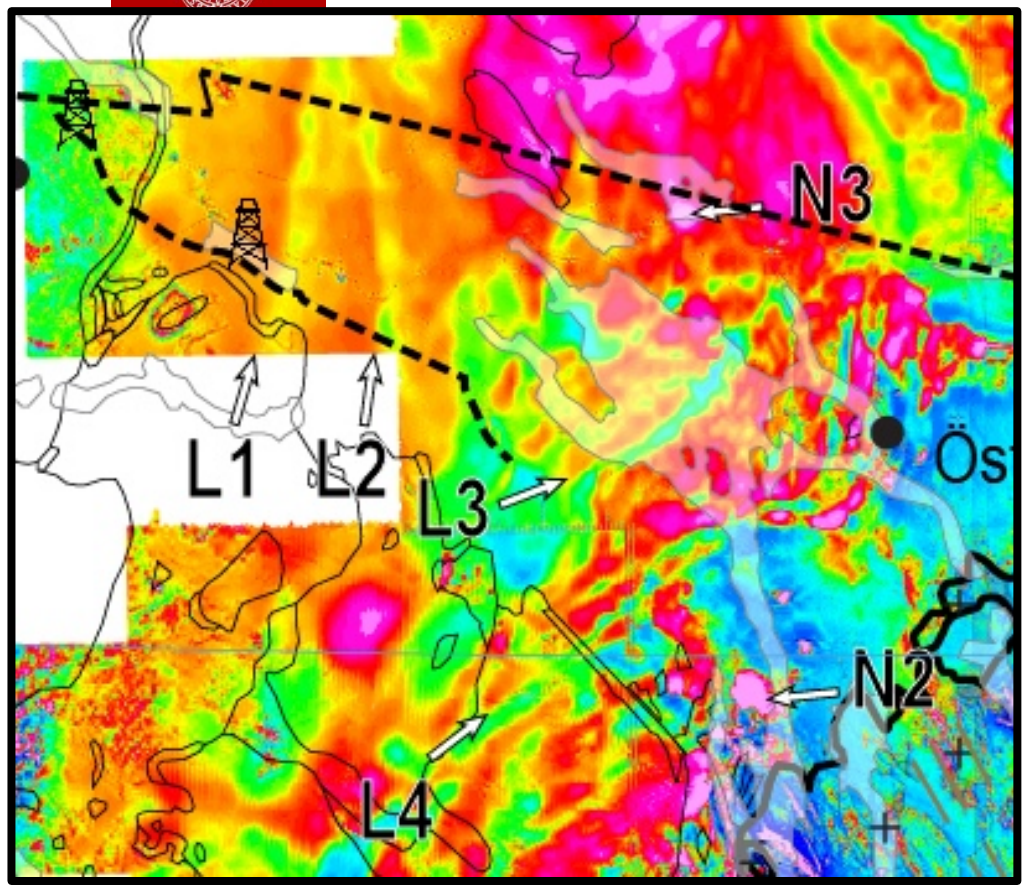
*What is the geometry of these anomalies in map view and in 3D?*

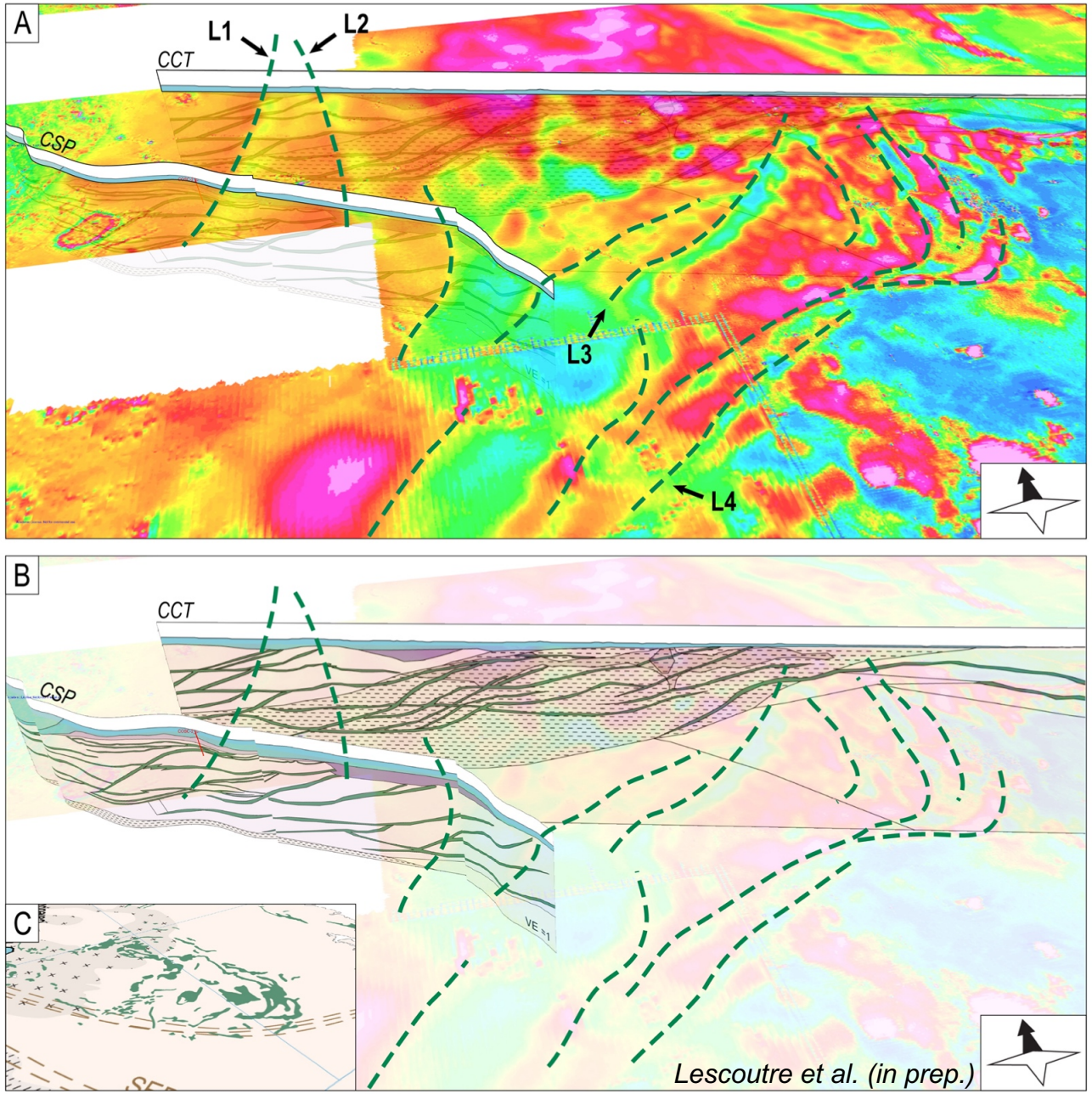


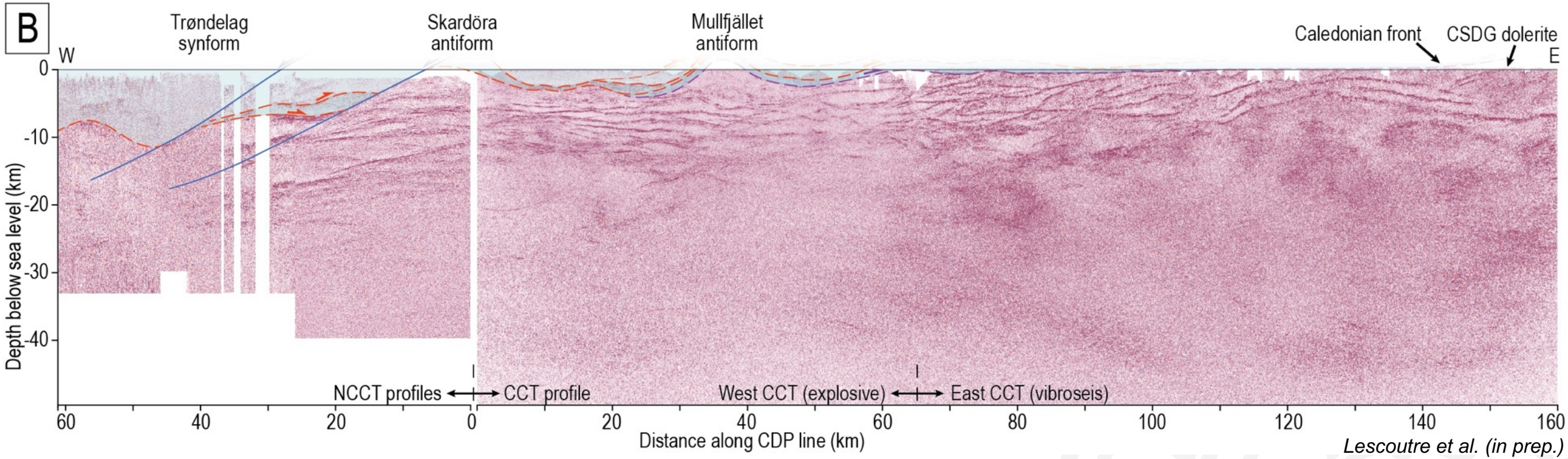

*Indication about the 3D geometry of the dolerites between the CCT and CSP profiles*



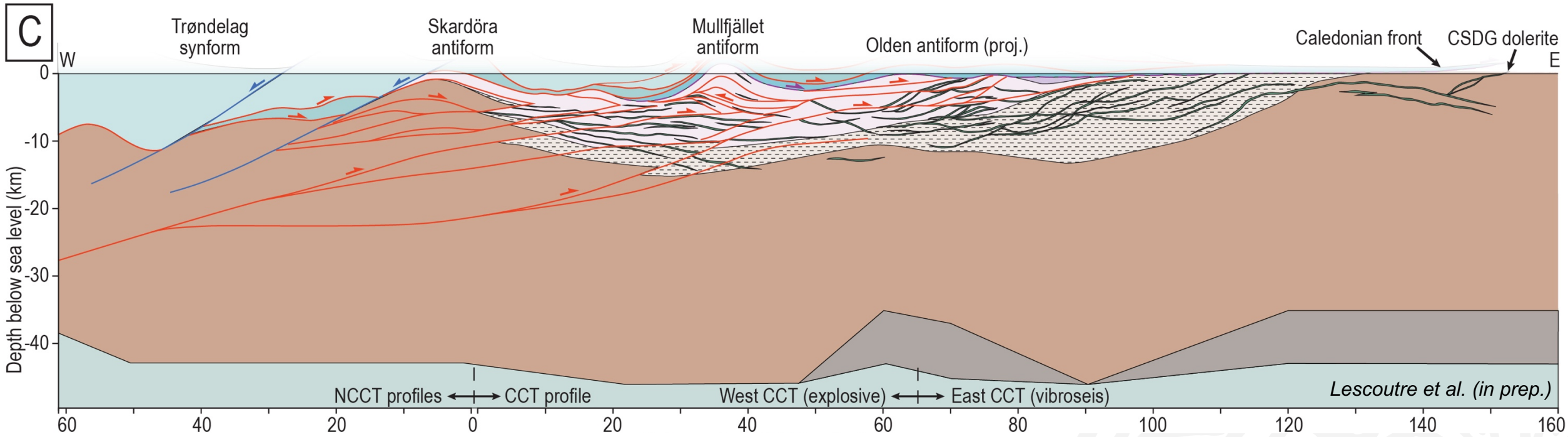

*Lescoutre et al. (in prep.)*



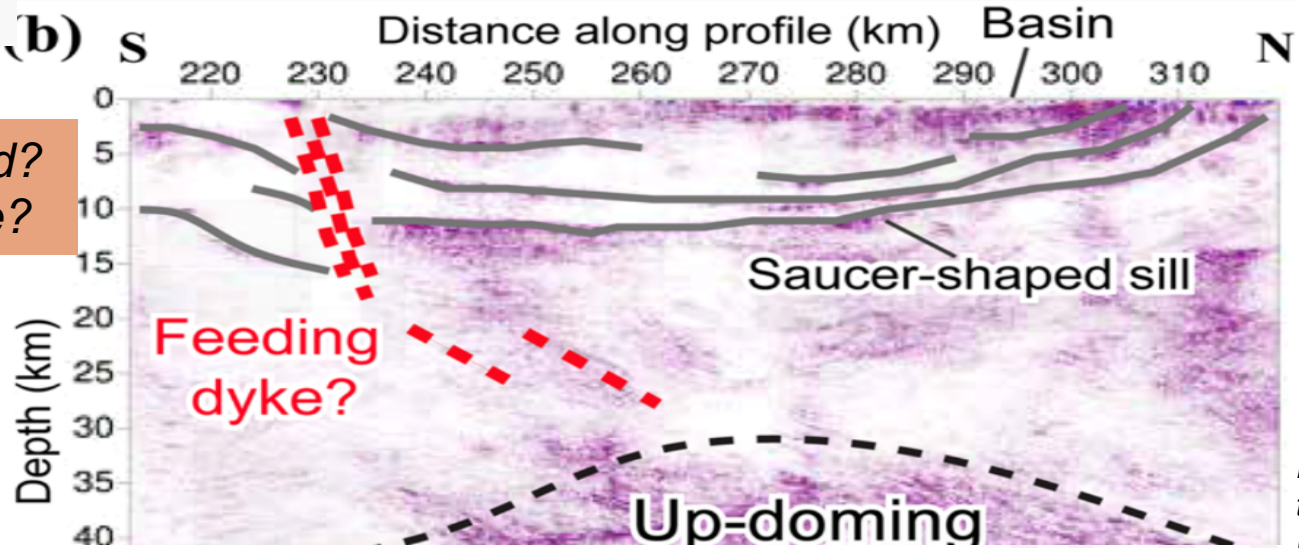



*Lescoutre et al. (in prep.)*



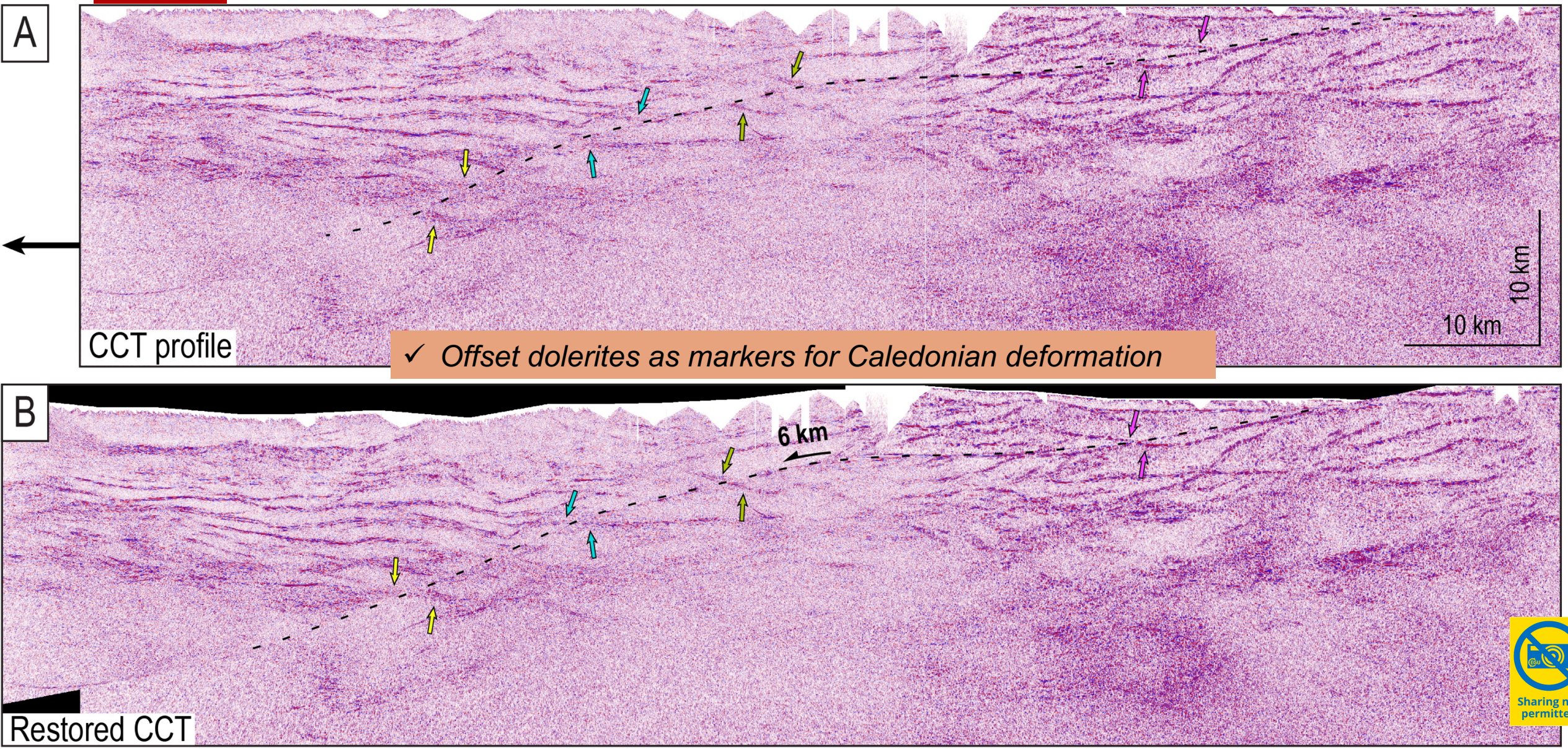

*Velocity model from England & Ebbing (2012)*

- *How is deformation distributed?*
- *What is the role of inheritance?*




Same scale!

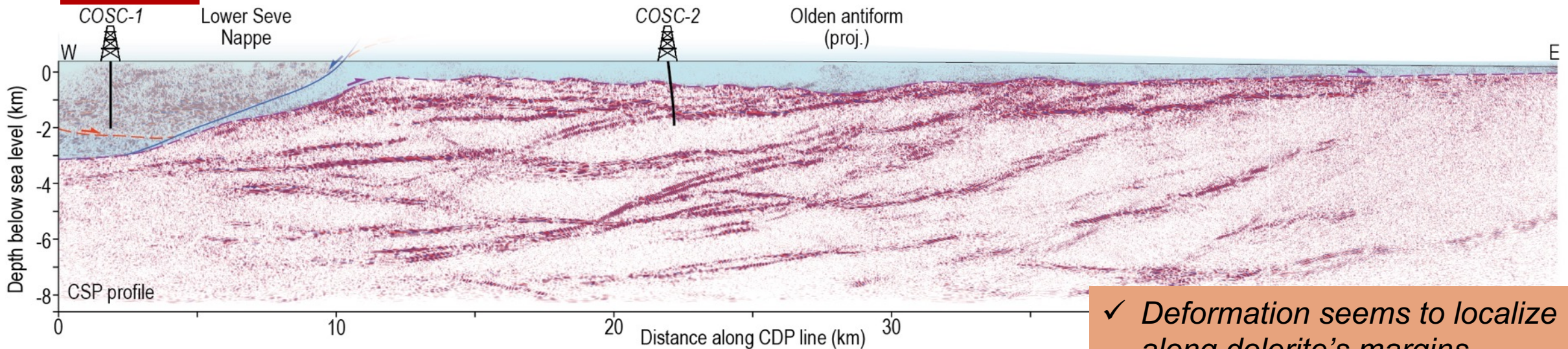
*Interpreted Babel profile (line 1) in the Bothnian sea, from Buntin et al. (2019)*



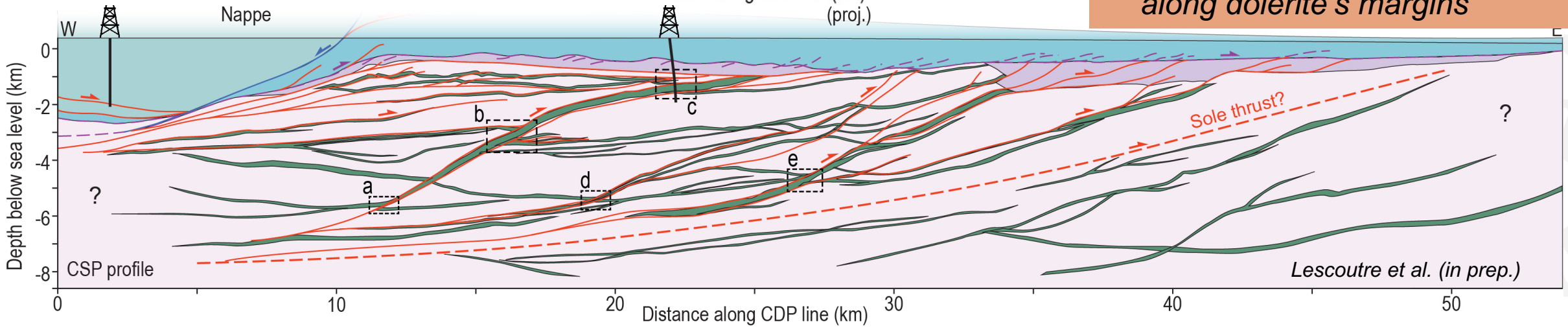

✓ *Offset dolerites as markers for Caledonian deformation*

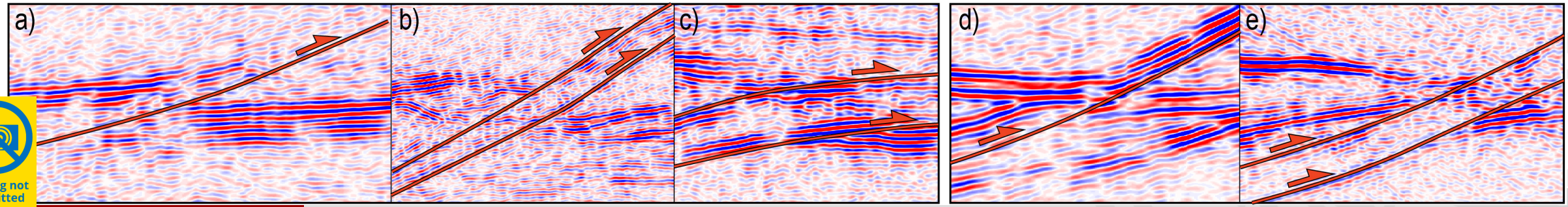


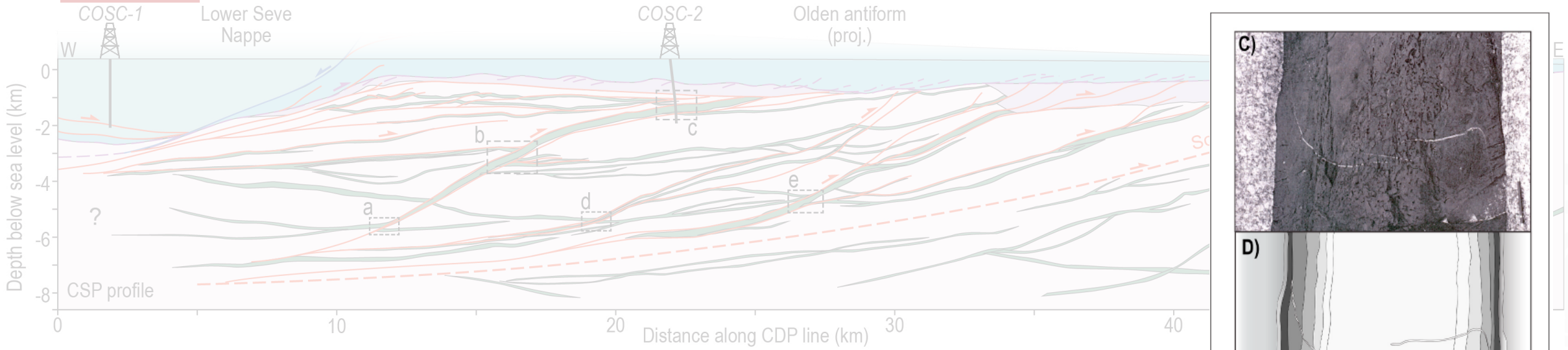
*Lescoutre et al. (in prep.)*




✓ *Deformation seems to localize along dolerite's margins*



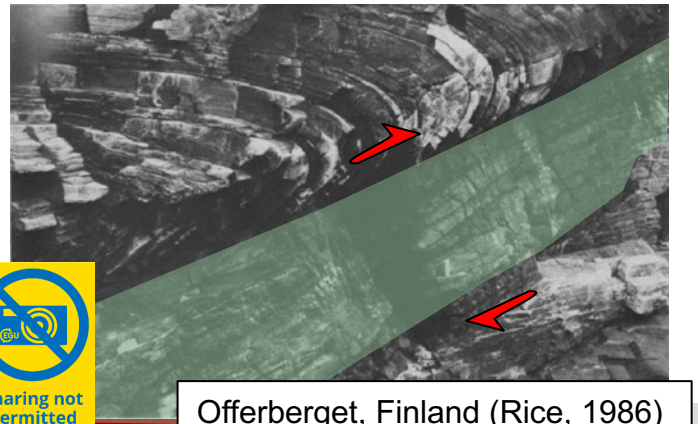





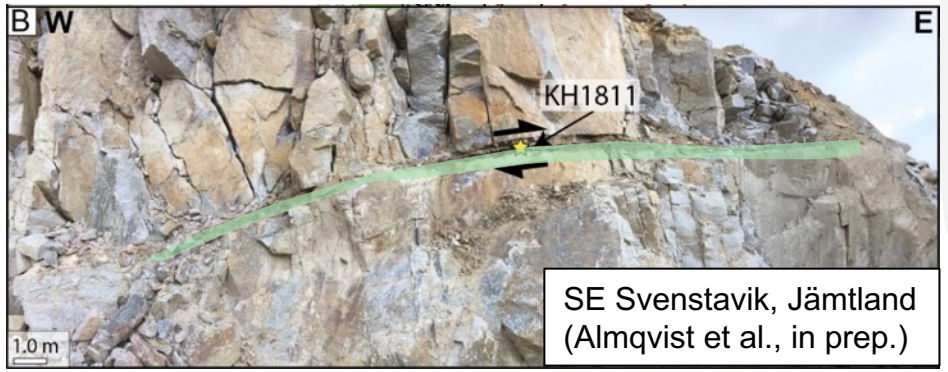




Wilson et al. (2020)

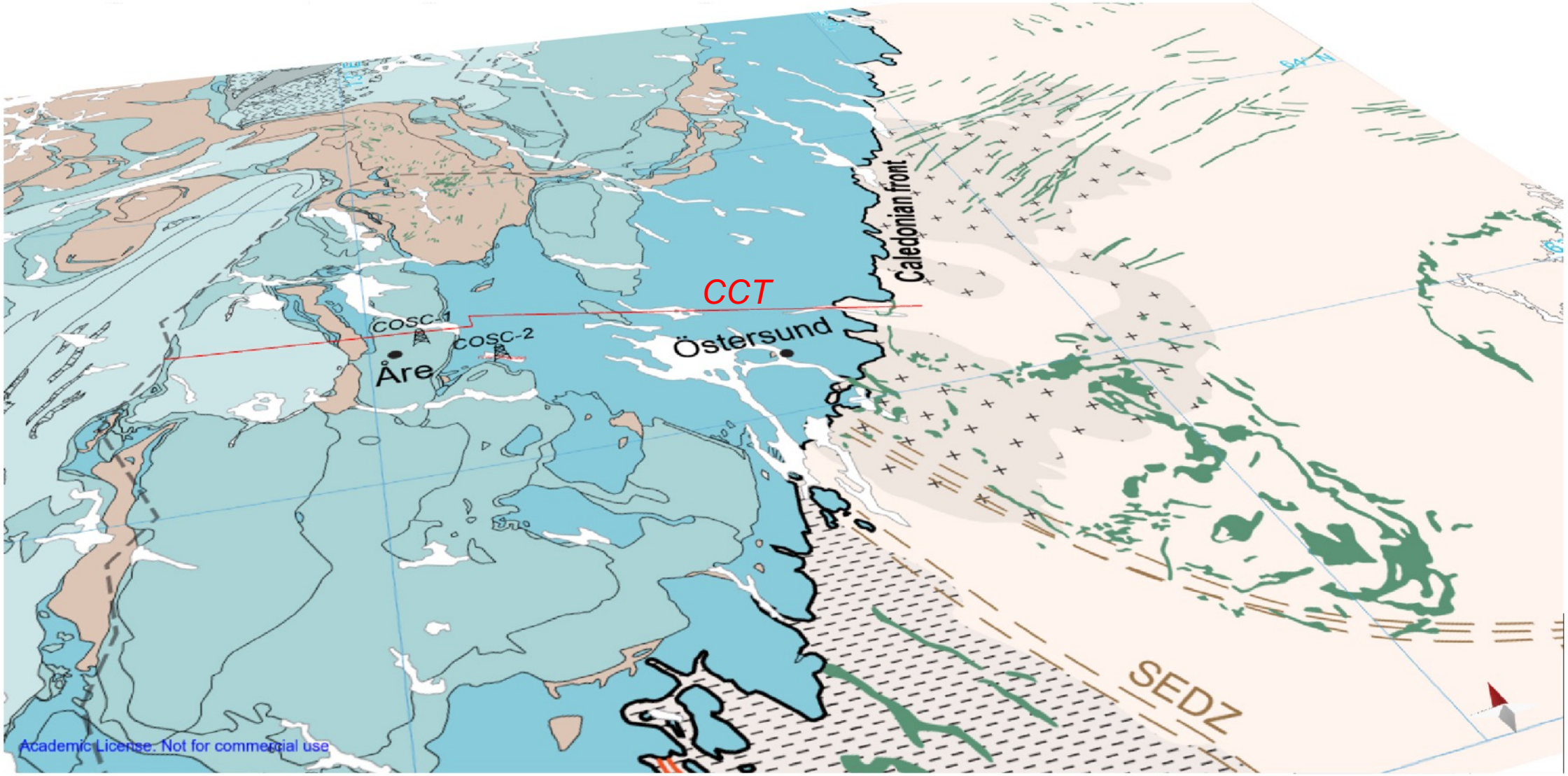


Offerberget, Finland (Rice, 1986)

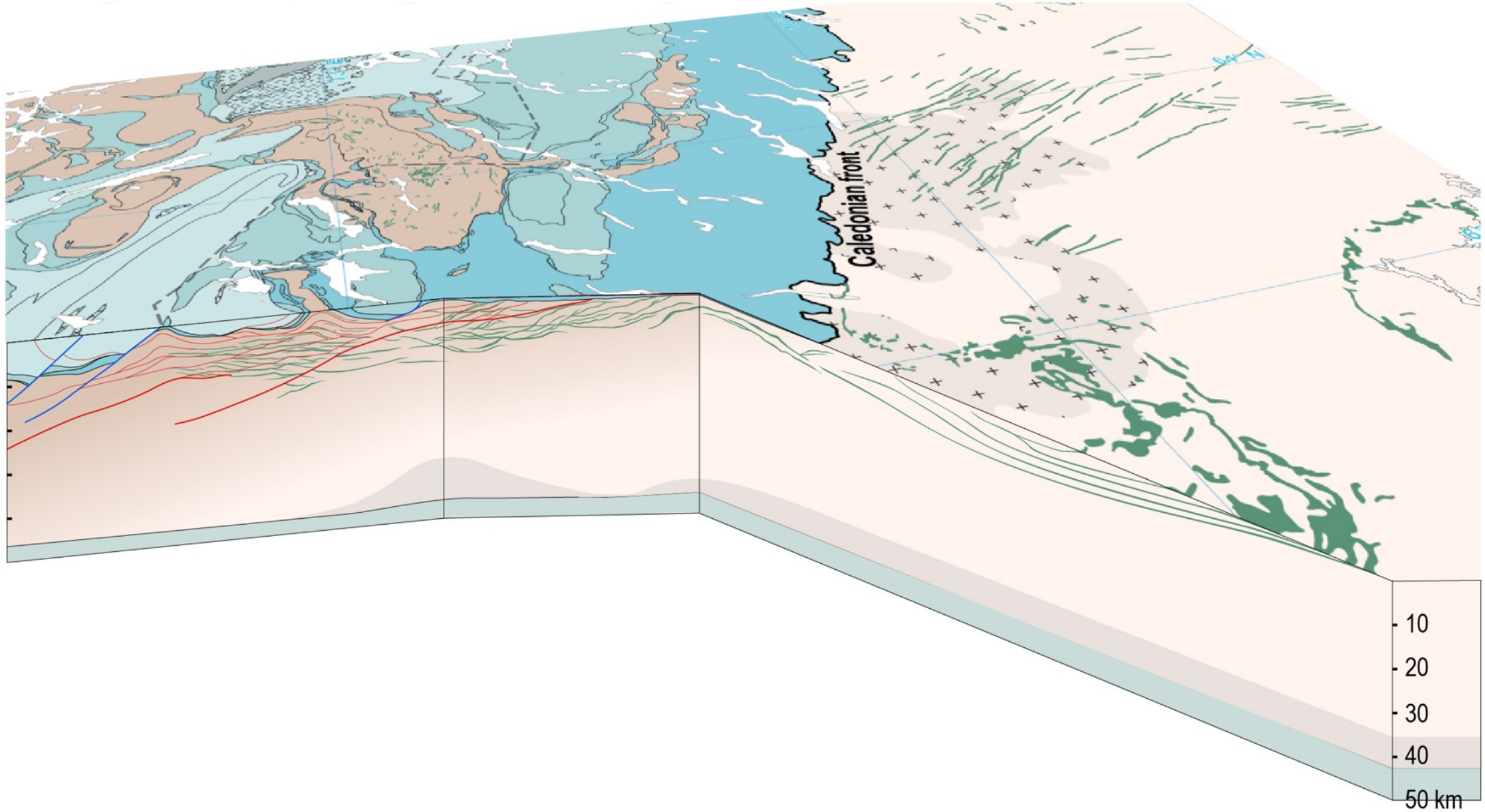



SE Svenstavik, Jämtland (Almqvist et al., in prep.)

- ✓ *Deformation seems to localize along dolerite's margins*
- ✓ *Already observed in the Caledonides and in other tectonic systems*

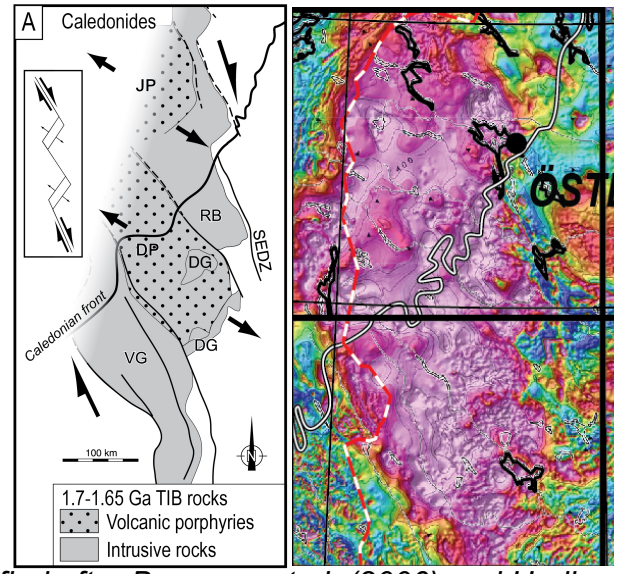



*Lescoutre et al. (in prep.)*




*Lescoutre et al. (in prep.)*

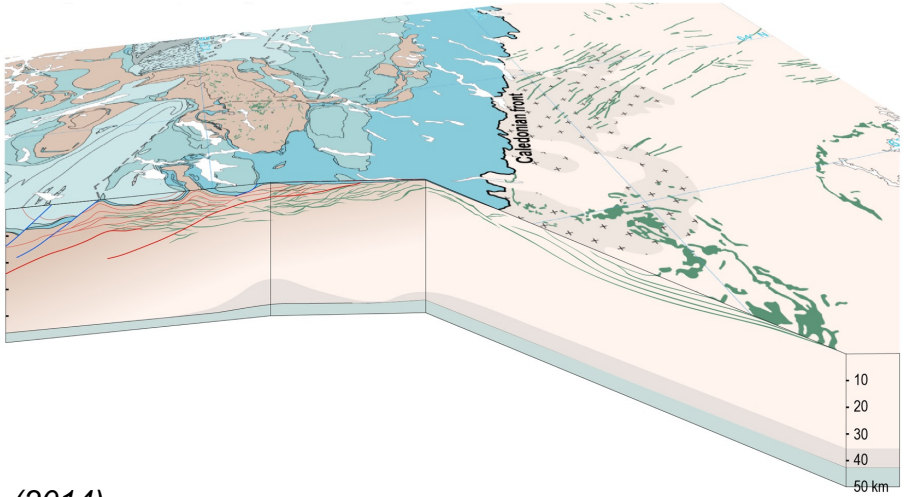
# *Remaining questions and future research projects?*



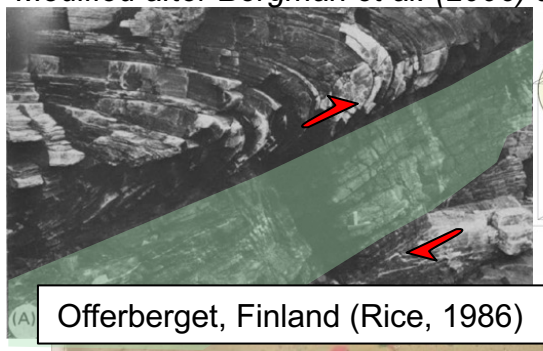




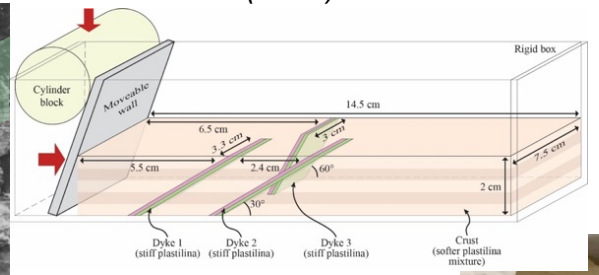
*Modified after Bergman et al. (2006) and Hedin et al. (2014)*



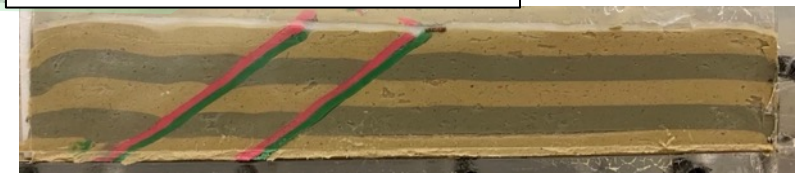

- *Westward prolongation of the SEDZ/HSZ and link with the emplacement of the TIB? With Caledonian deformation?*
- *En-échelon volcanic basins?*
- *Parameters controlling flat-lying intrusions?*

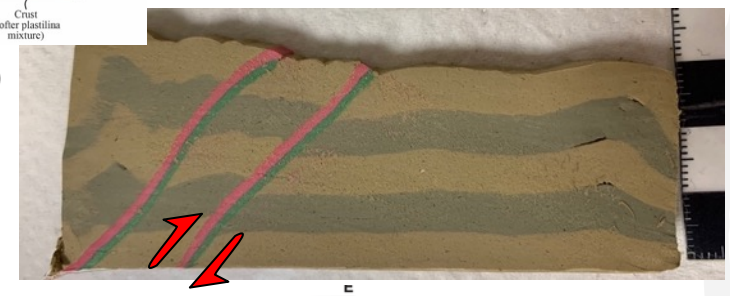


Offerberget, Finland (Rice, 1986)

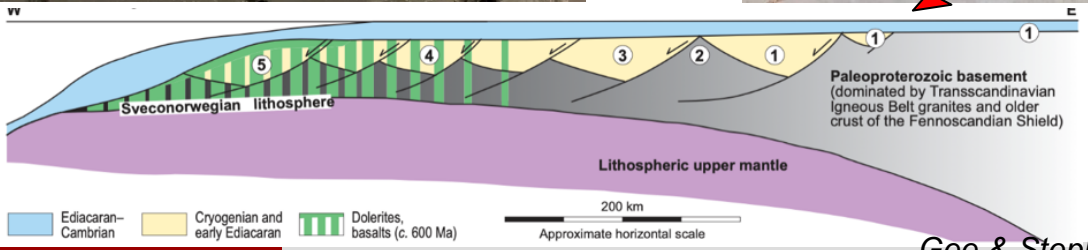



*Lescoutre & Koyi (in prep.)*





- *Role of inherited mafic intrusions in localizing deformation in the basement? Influence of temperature, fluids, rheology, intrusion's thickness?*




*Gee & Stephens (2020)*

- *Magma-rich vs. magma-poor passive margins: influence on reactivation during incipient orogenic evolution?*