



**Optical televIEWing (OPTV)
ice-mass boreholes**

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Centre for Glaciology, Aberystwyth University

OPTV of ice-mass boreholes

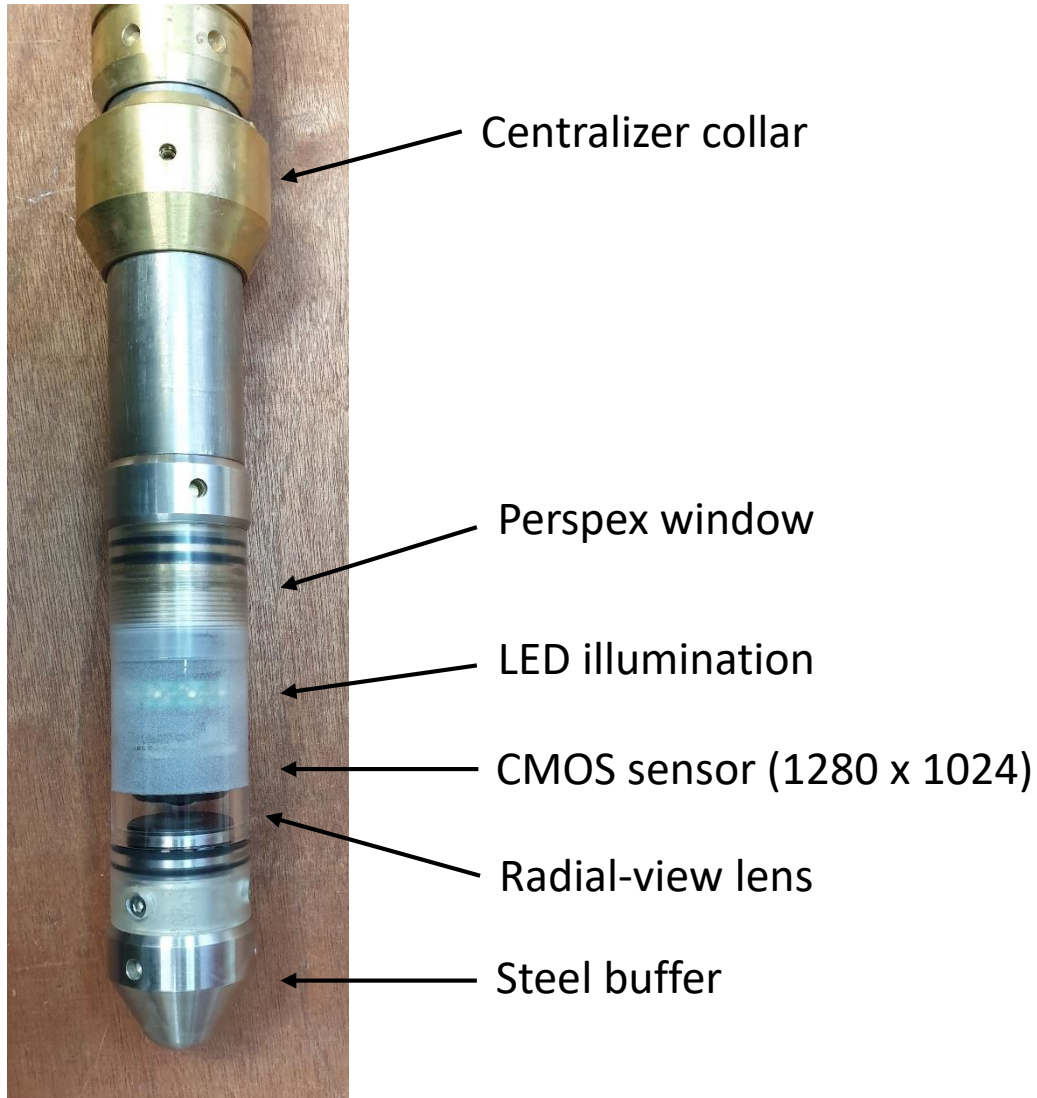
Overview

- **Background**
- **Applications**
- **Potential at IceCube...**

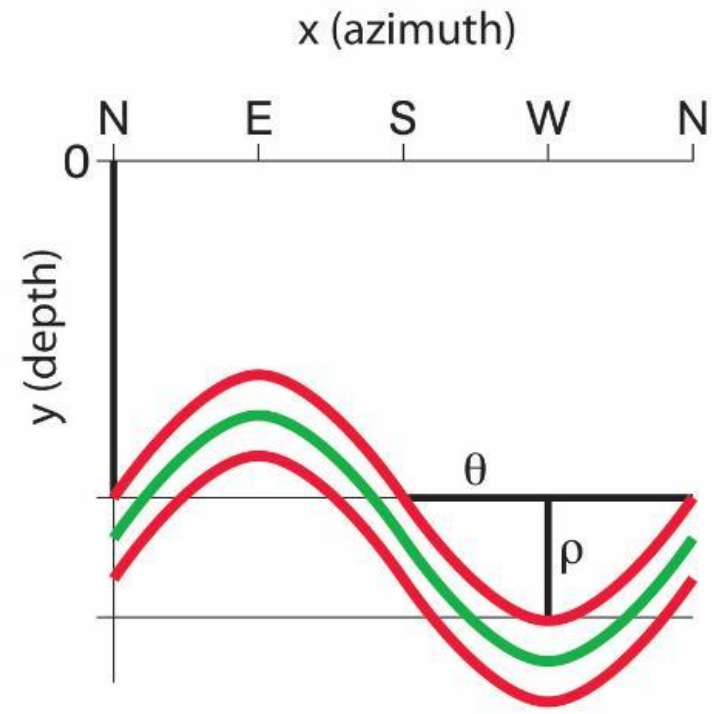
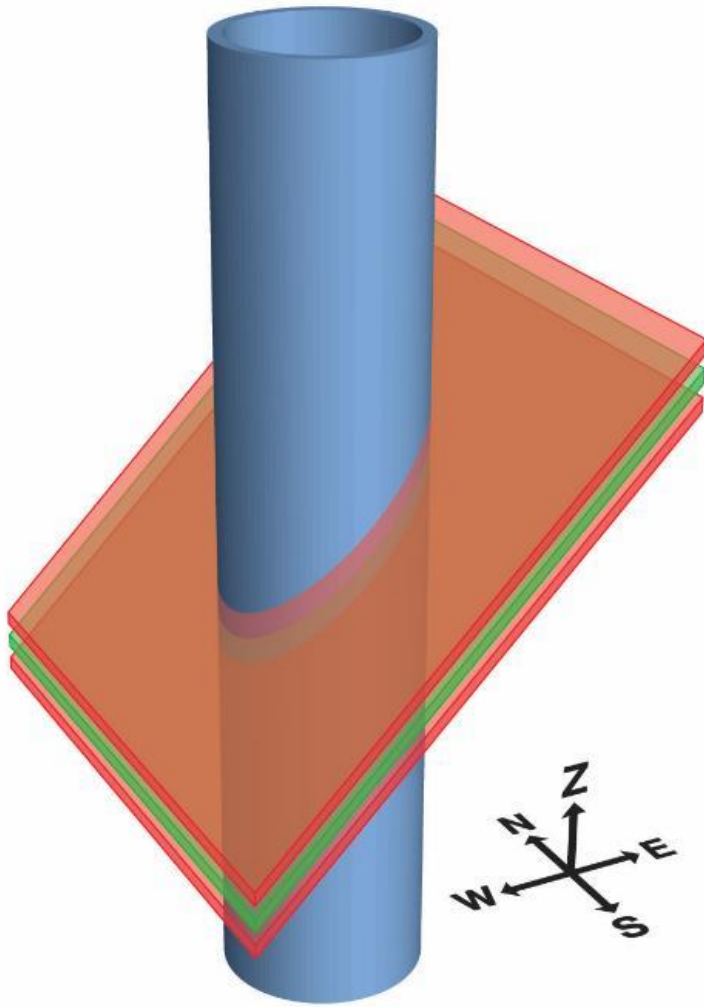
Traditional (directional) borehole camera image



OPTV: radial-view borehole camera



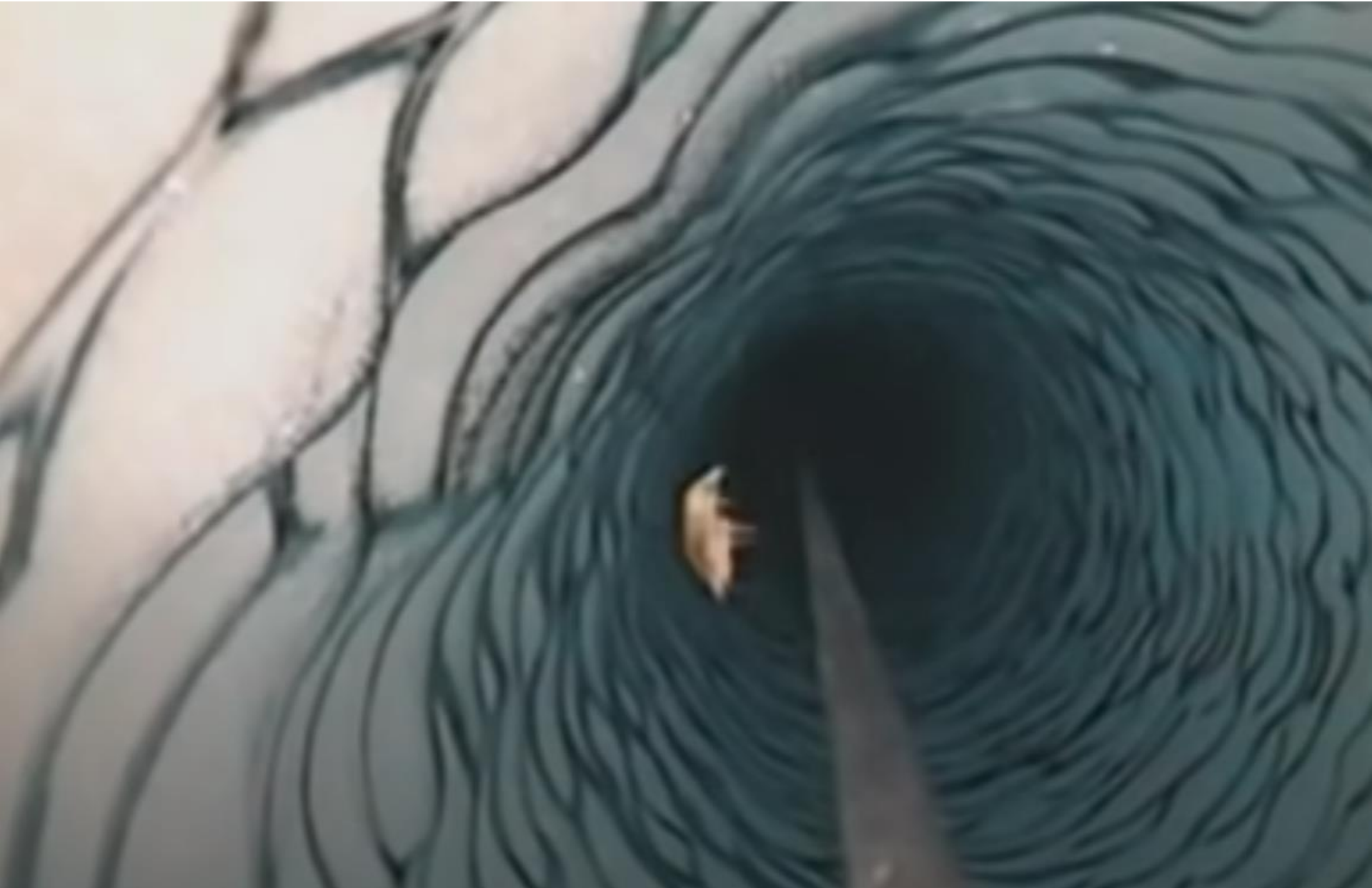
- Orientated
- Geometrically accurate
- RGB (24 bit visible)
- High resolution (~1 mm)
- Complete wall (360°)
- Logging speed 1-5 m min⁻¹
- Length 2.13 m; diameter 46 mm; rated 2,000 m H₂O



ρ gives layer dip

θ gives layer dip direction

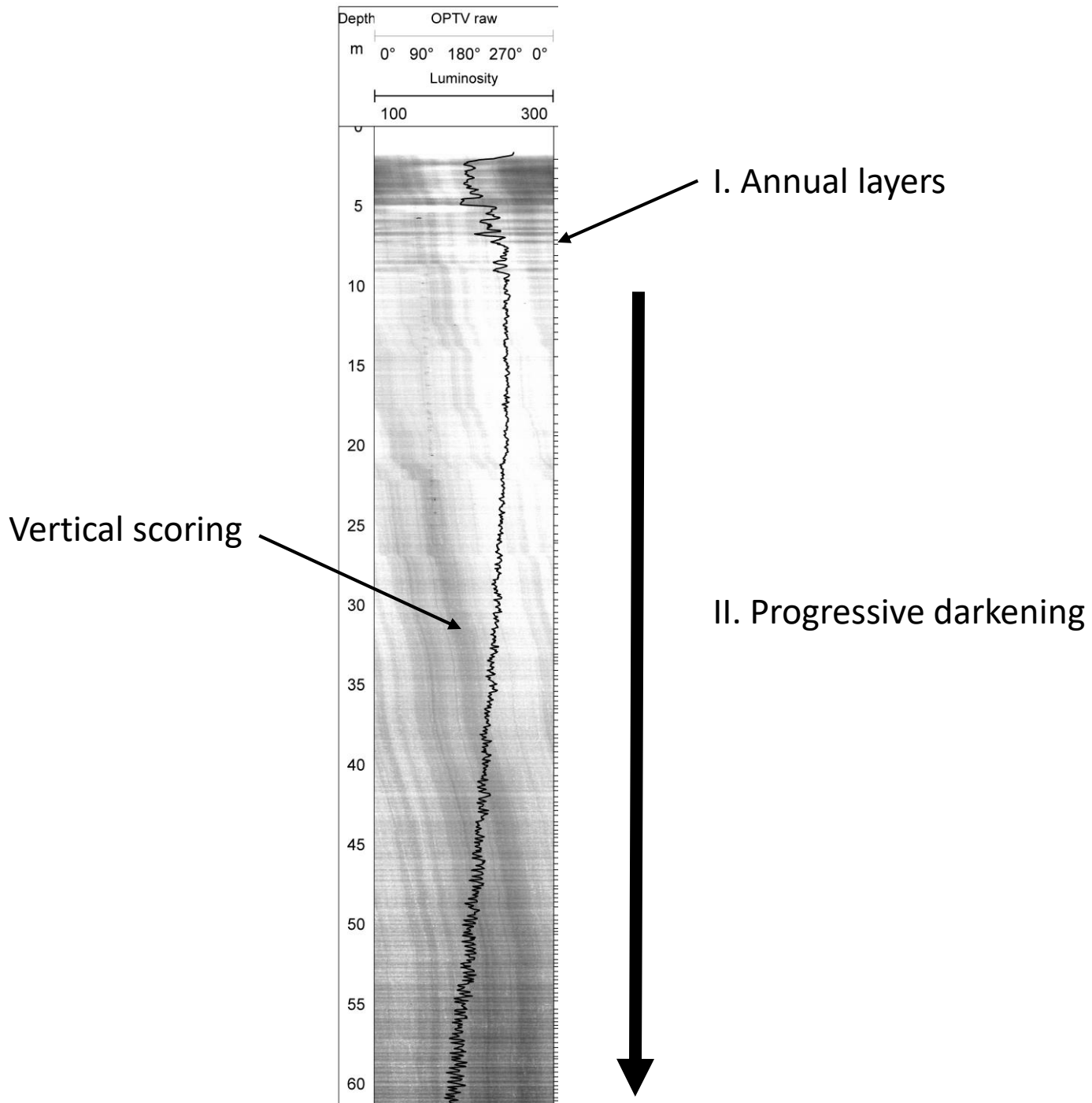
Directional borehole camera image



OPTV image



Rock borehole, RGL, UK.



OPTV of ice-mass boreholes

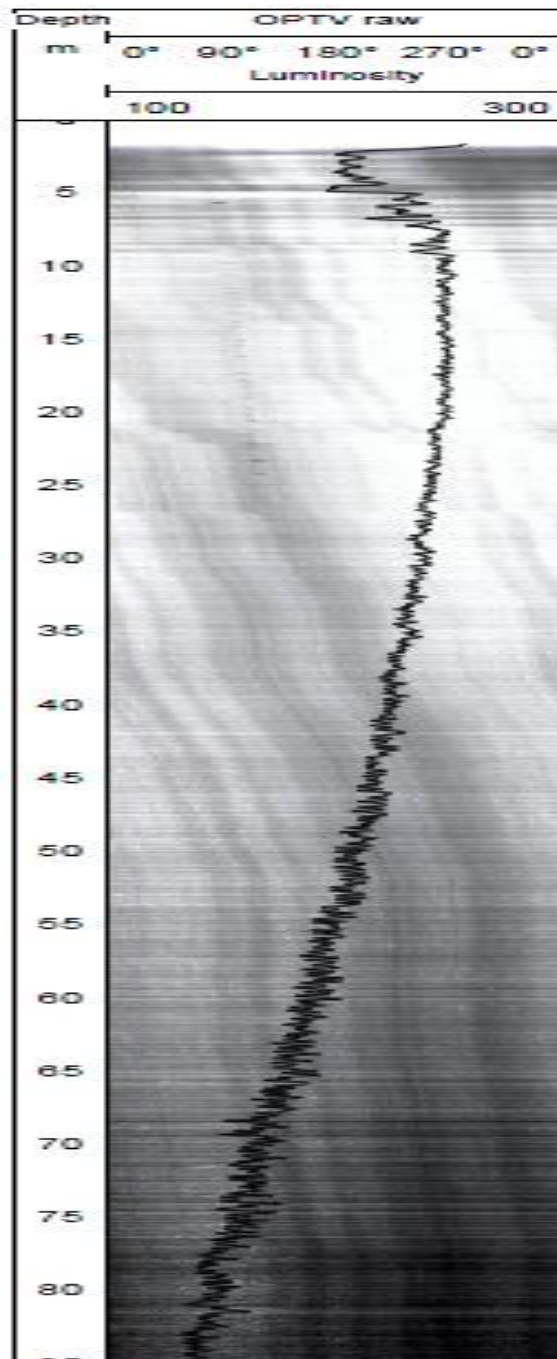
Overview

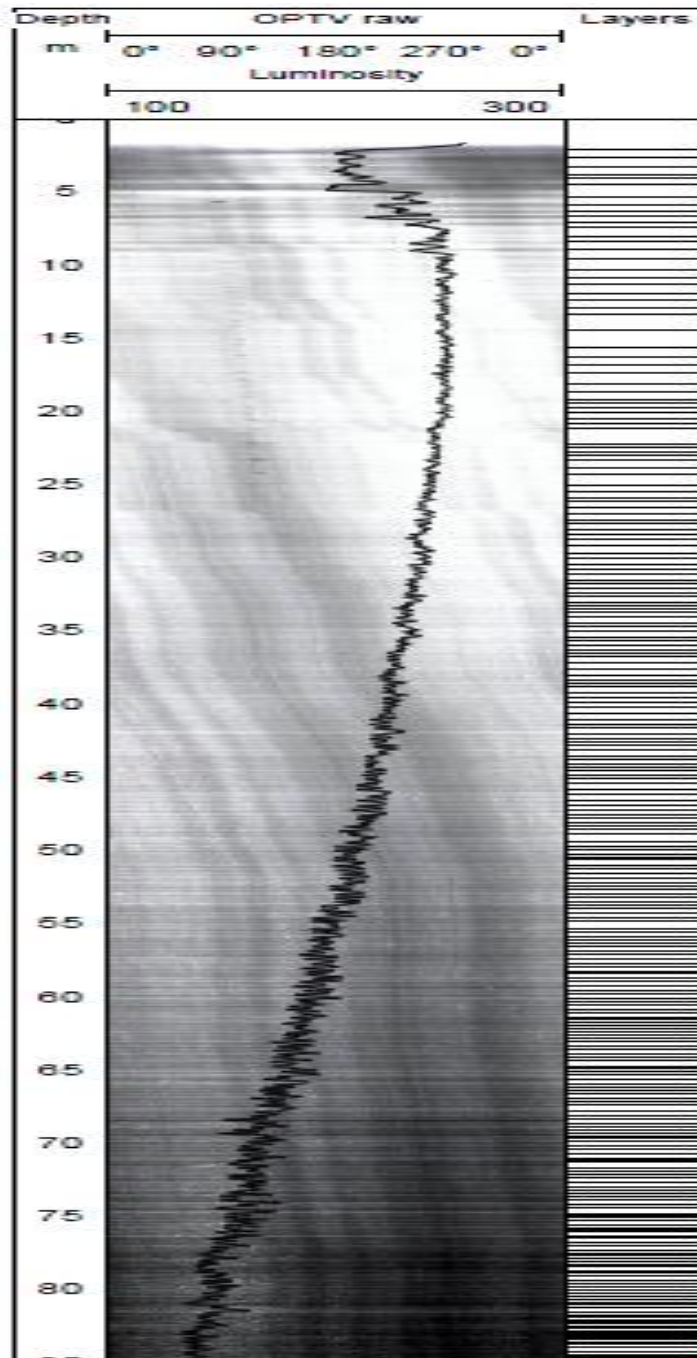
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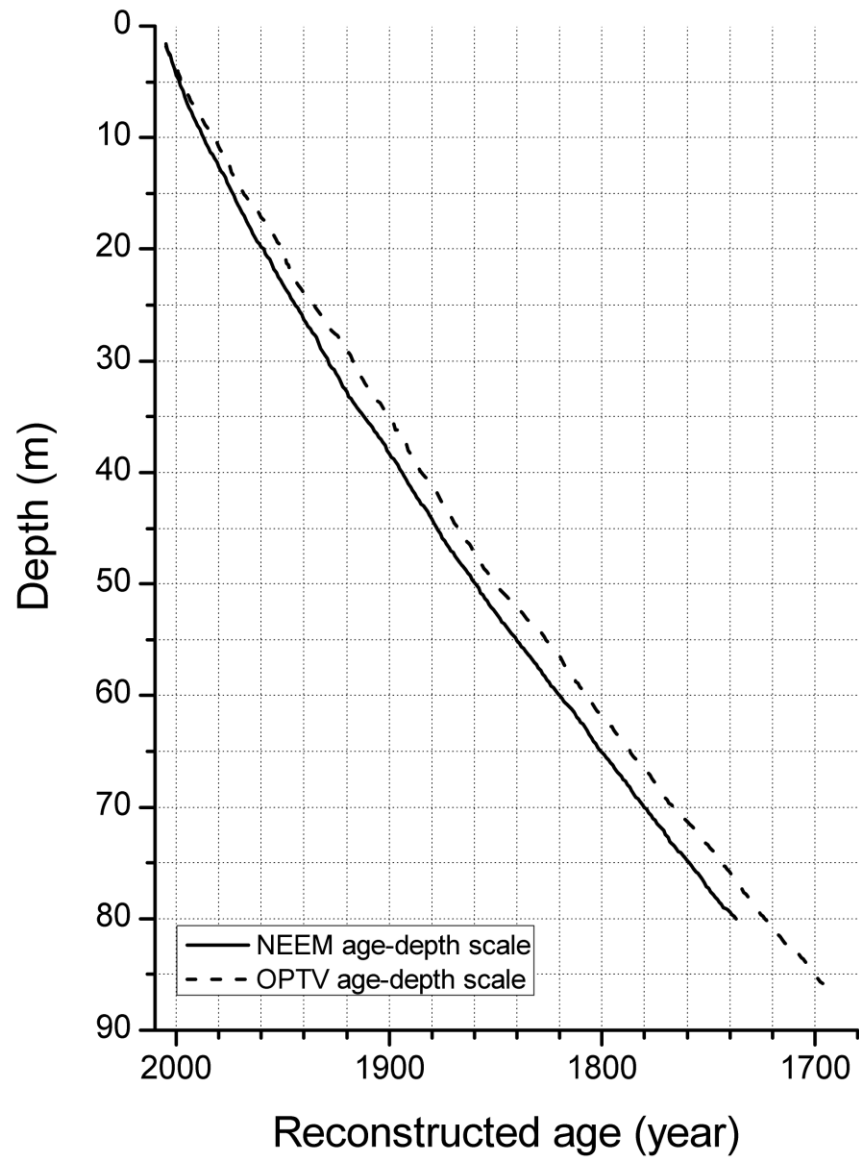
OPTV of ice-mass boreholes

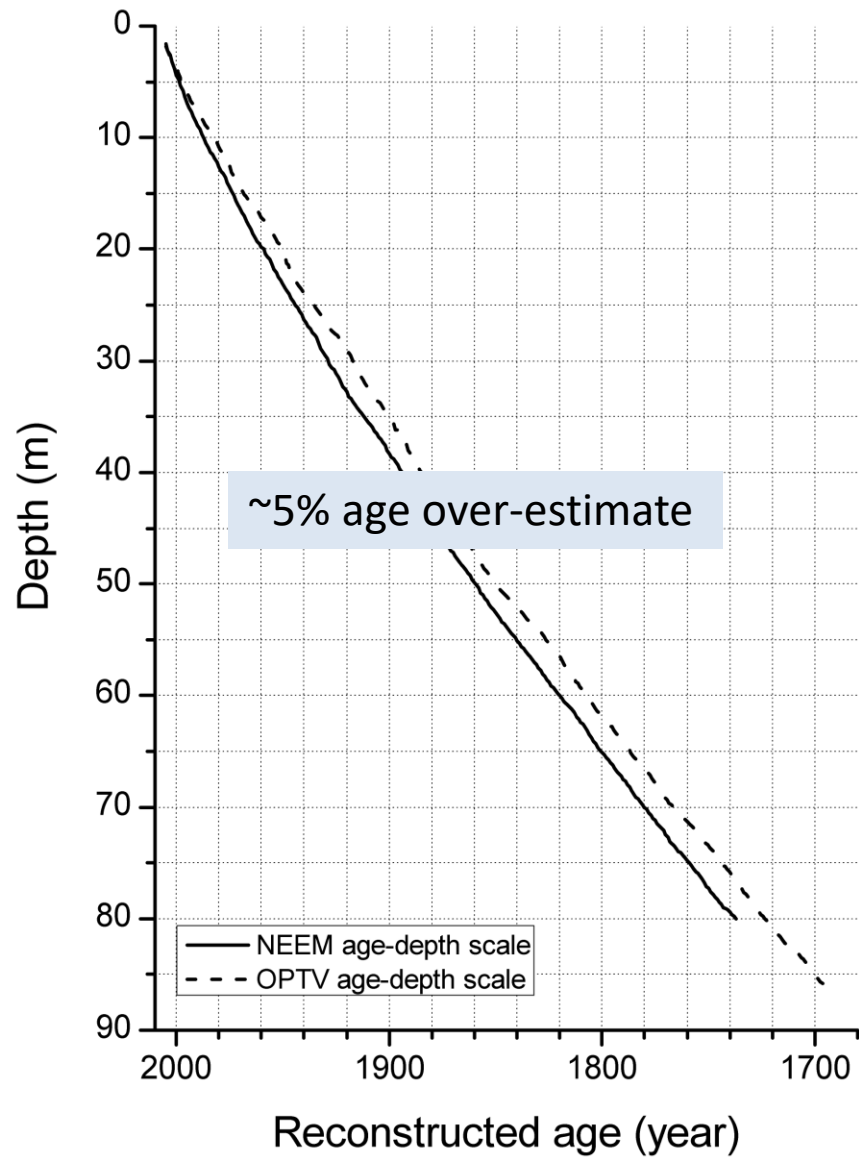
Applications

- **Layering / age-depth scale**
- **Infiltration ice**
- **Density**
- **Densification**
- **Structures**
- **Material properties and spatial variability**

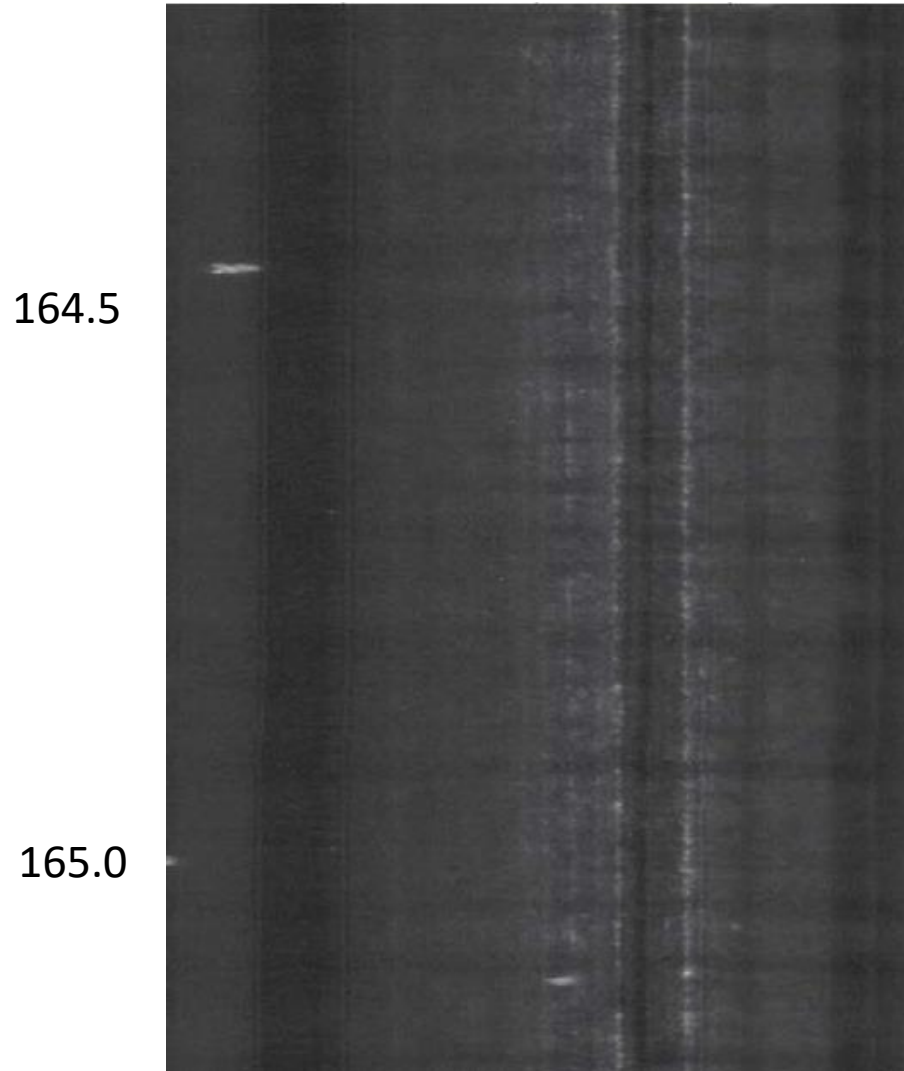




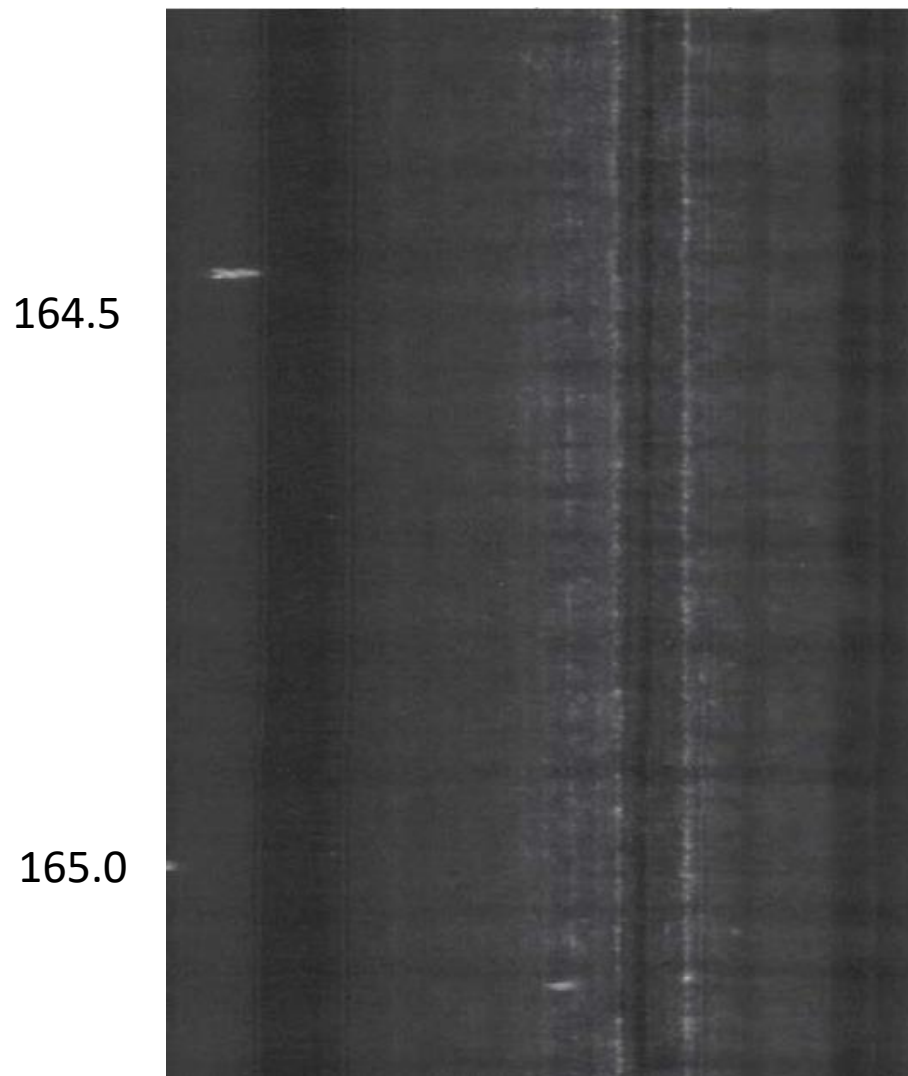




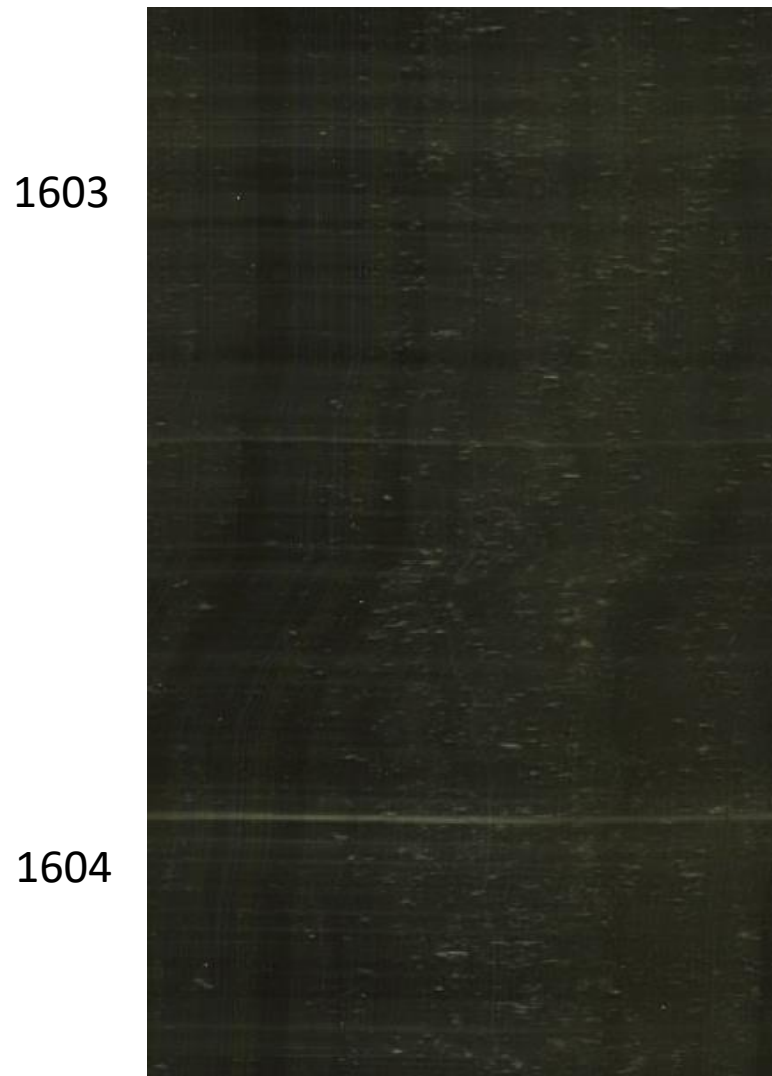
Annual layers



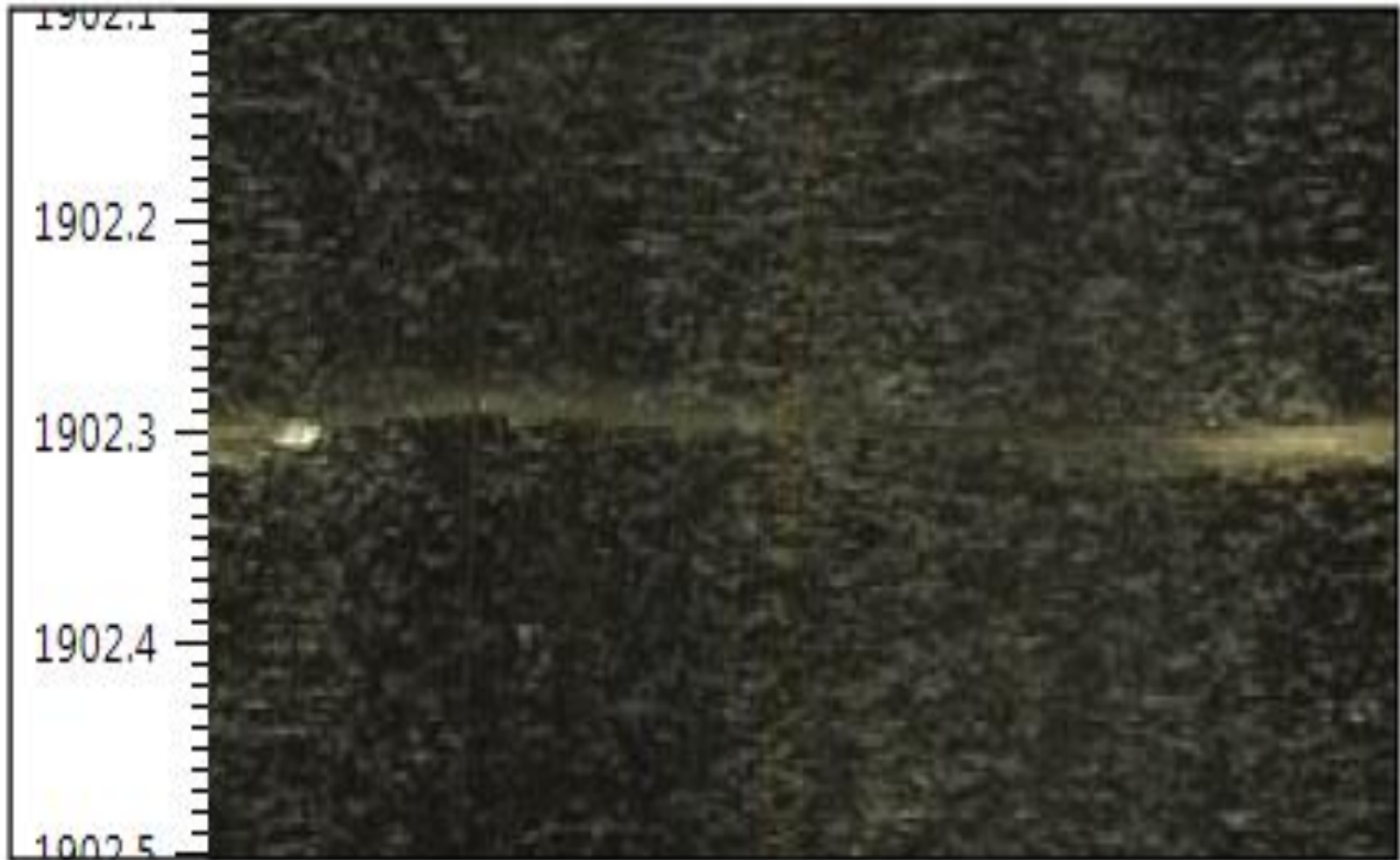
Annual layers



Dust layers



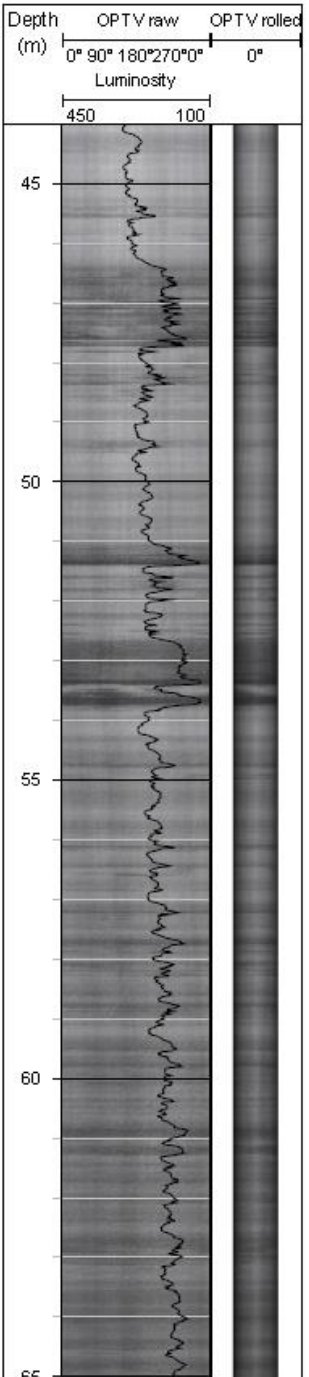
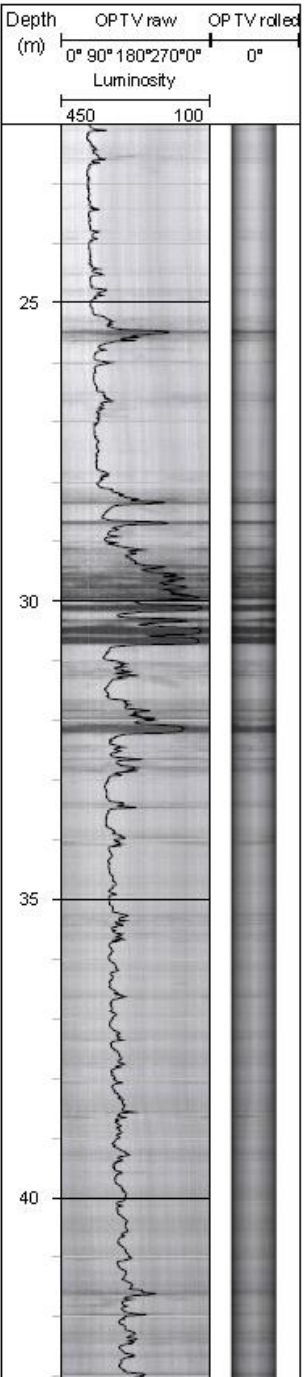
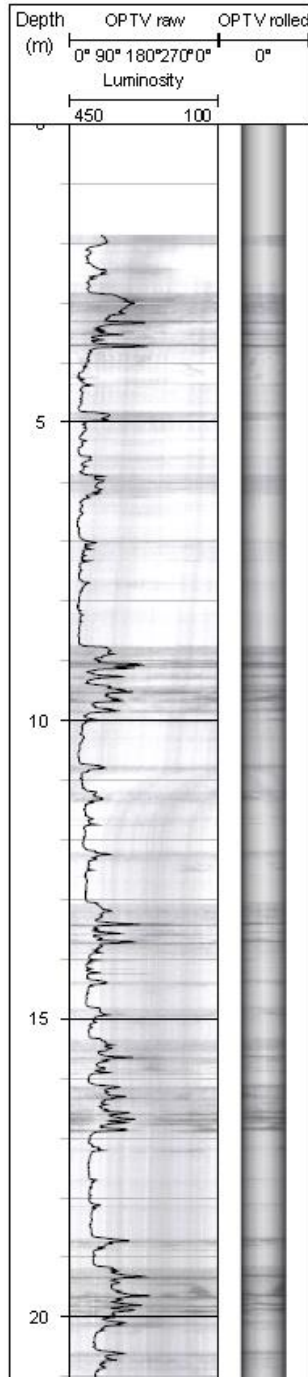
Dust layers



OPTV of ice-mass boreholes

Applications

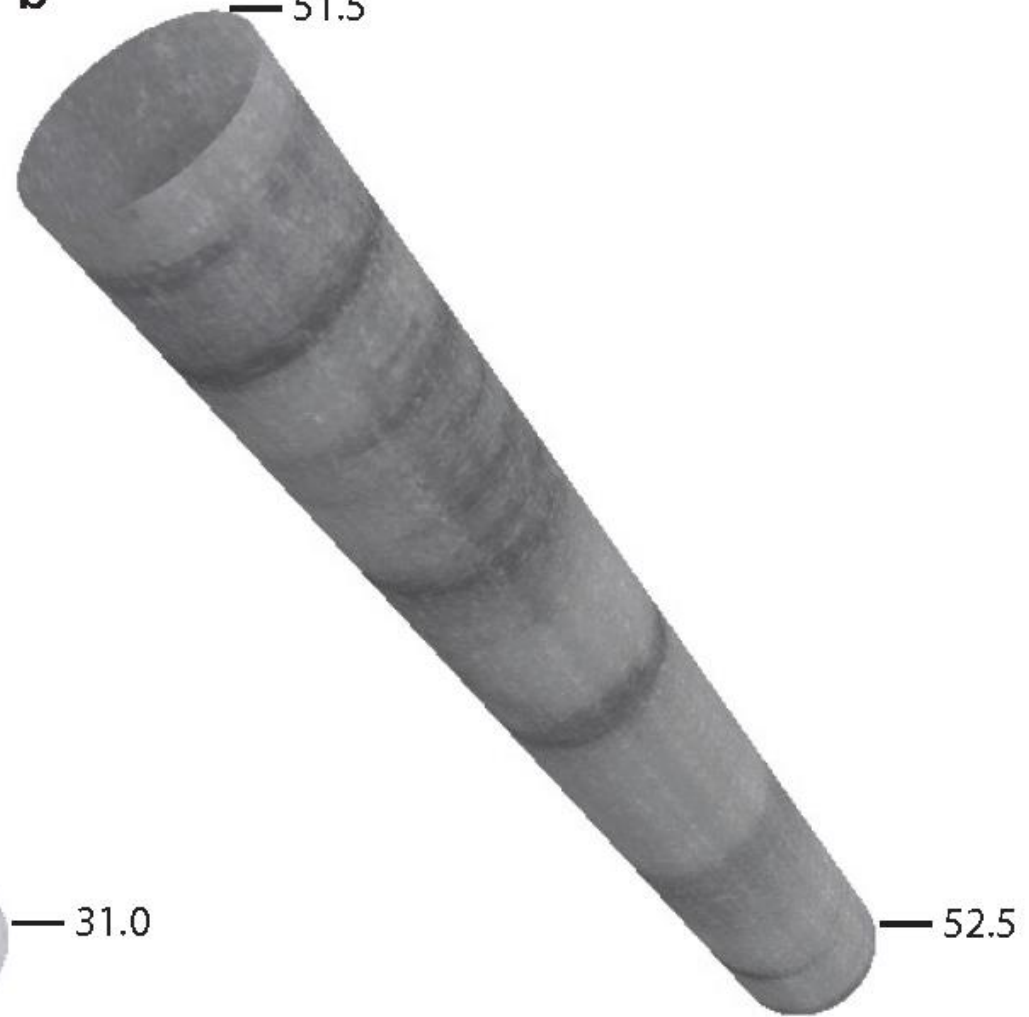
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a — 30.0



b — 51.5

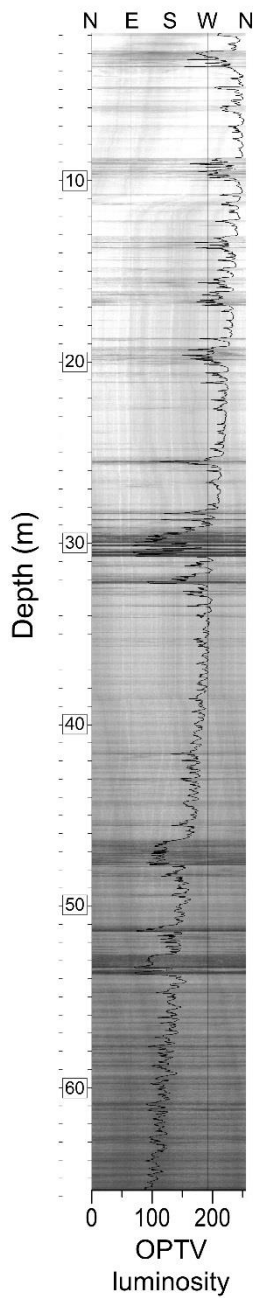


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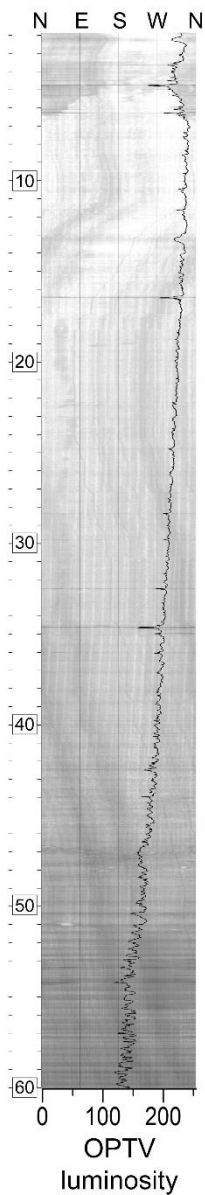
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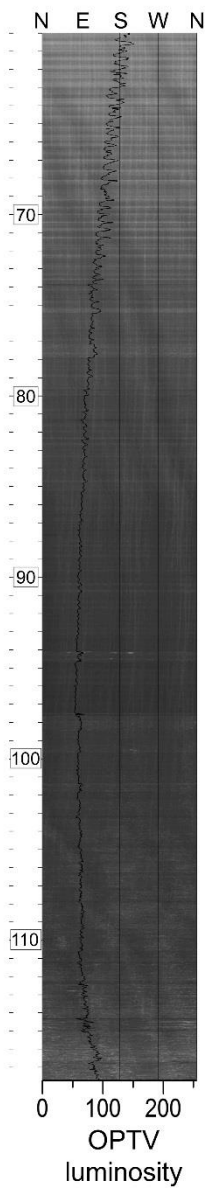
(a) RBIS

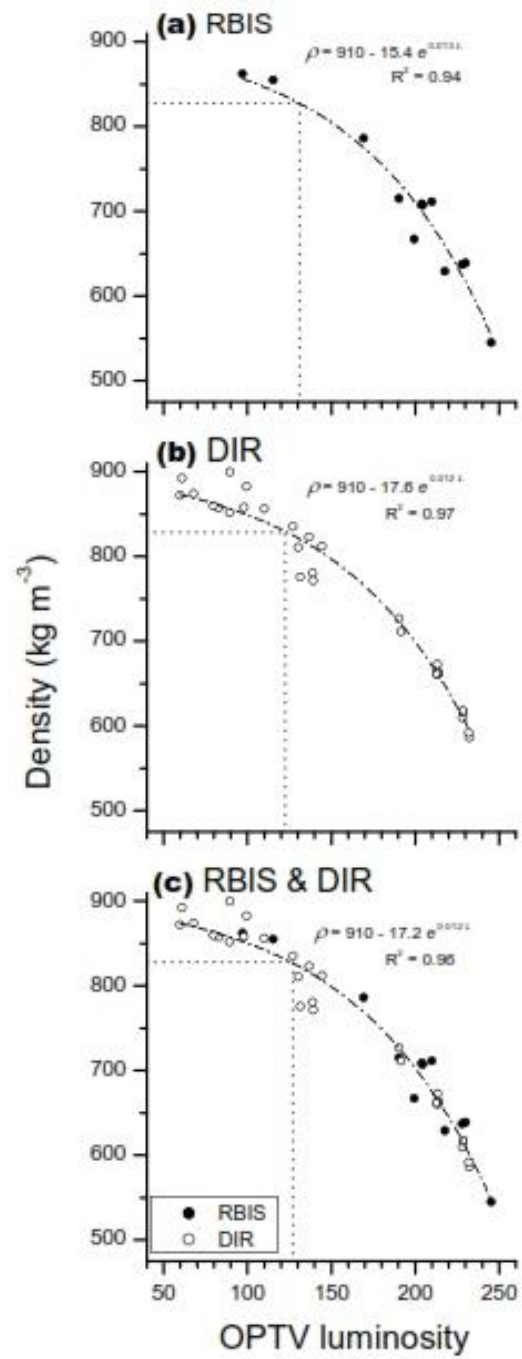
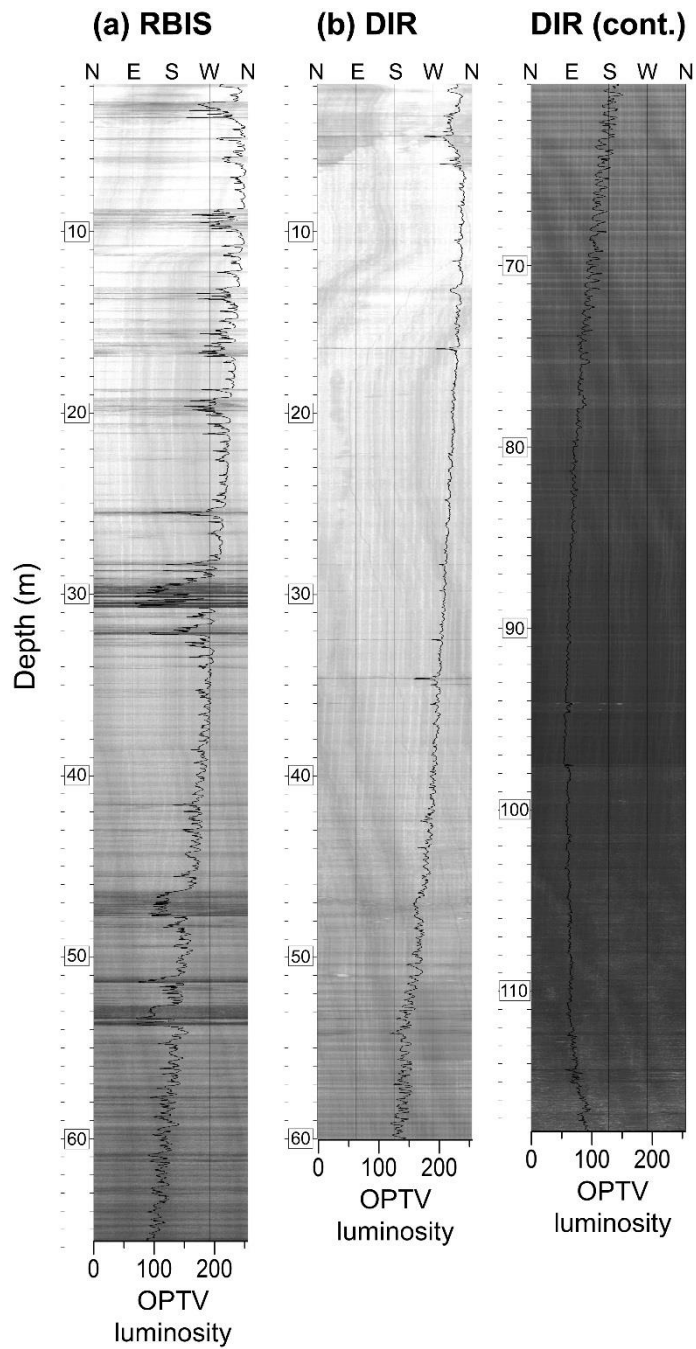


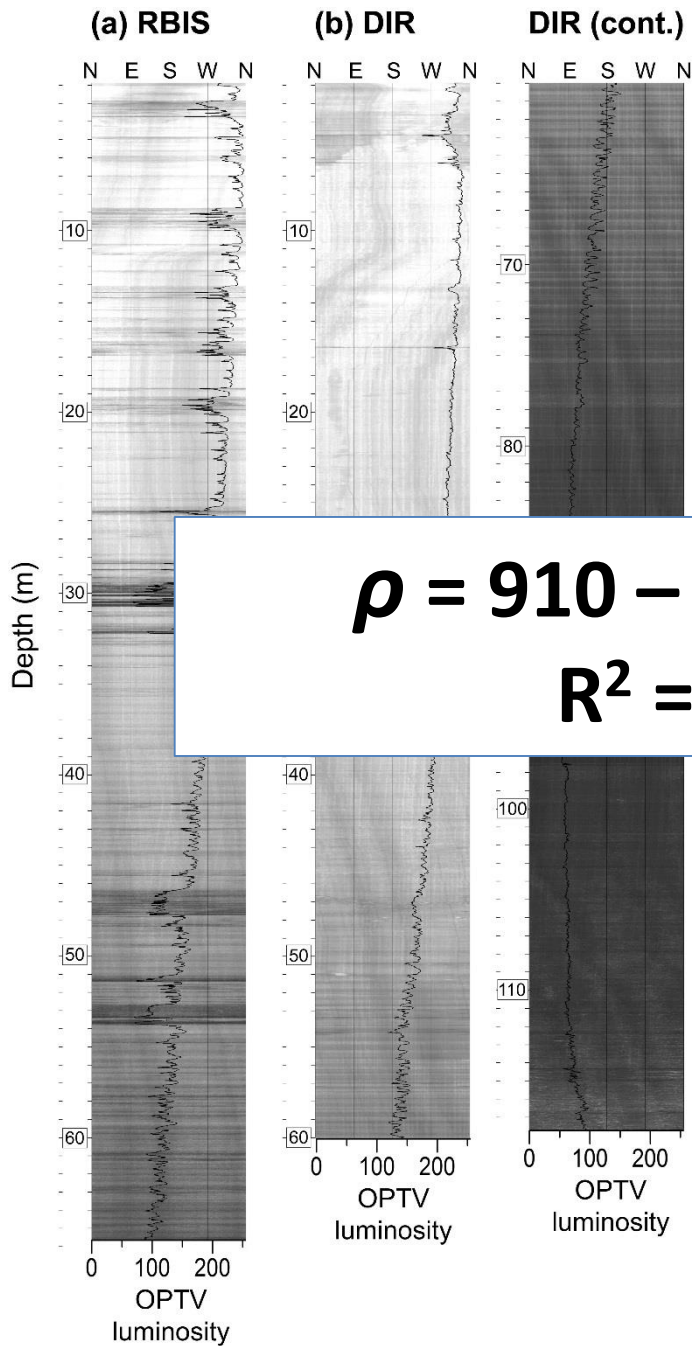
(b) DIR



DIR (cont.)

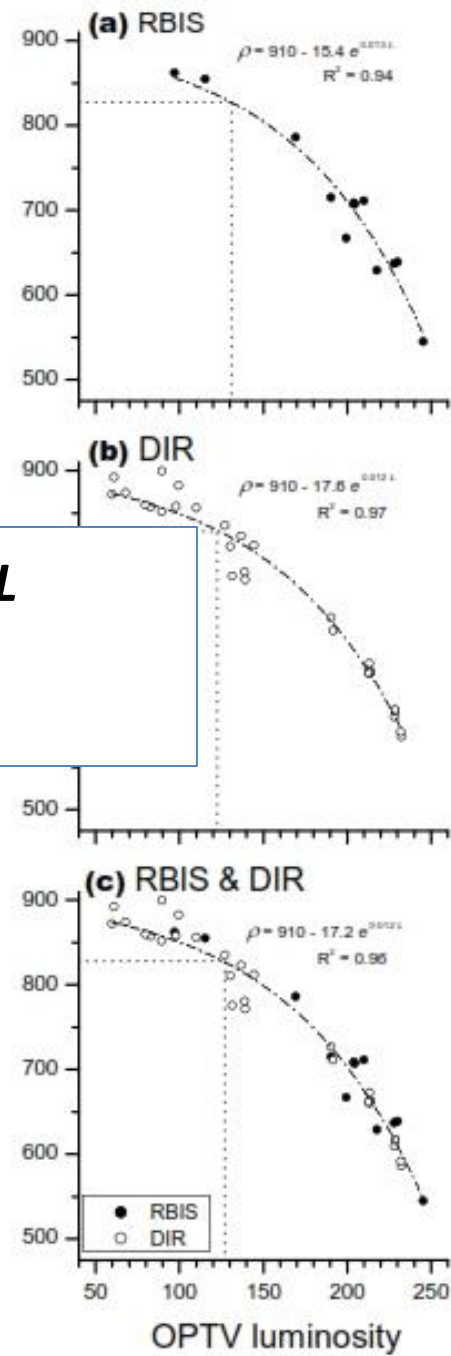






$$\rho = 910 - 17.2 e^{0.012L}$$

$$R^2 = 0.96$$

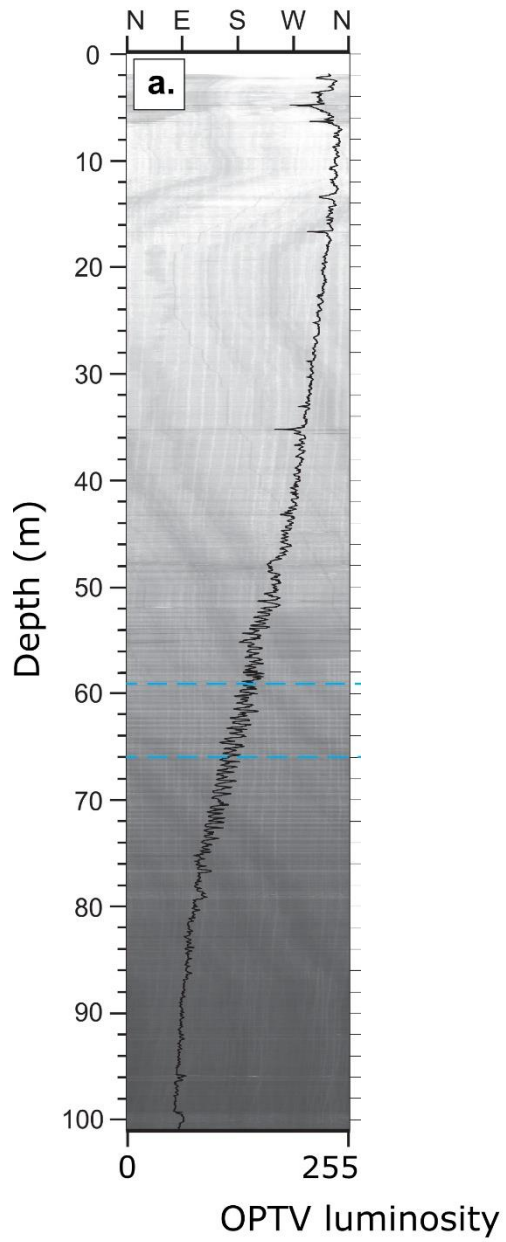


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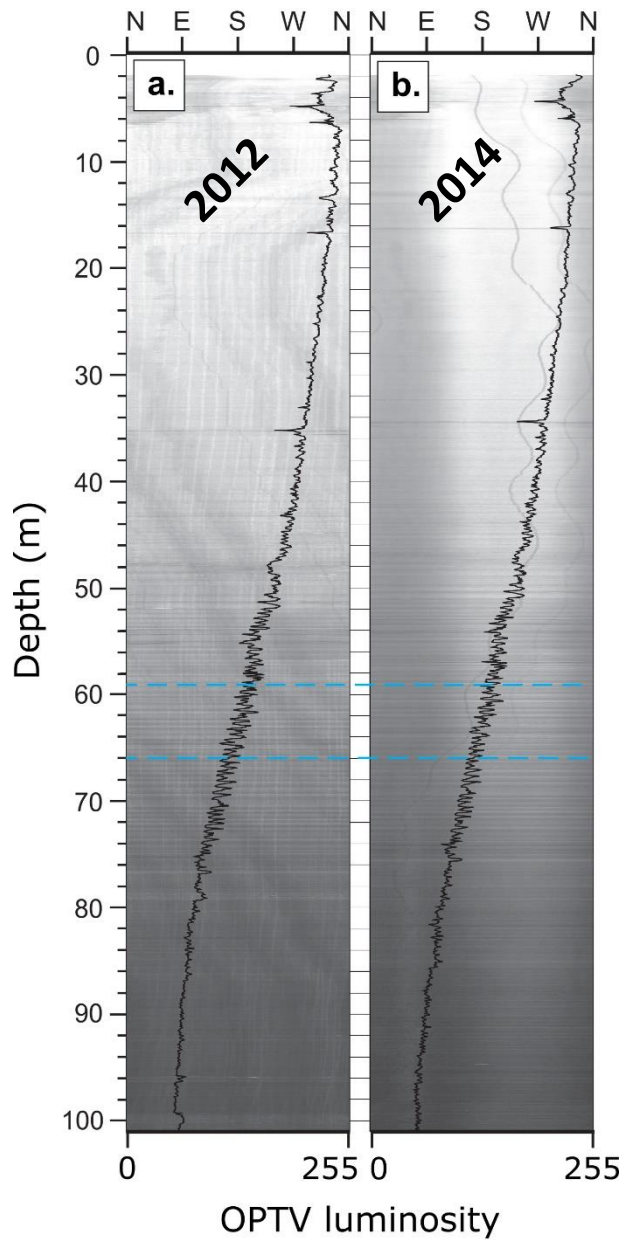
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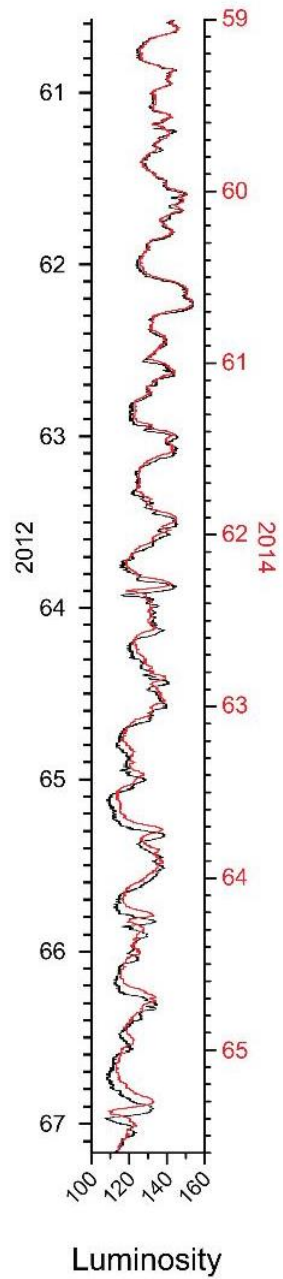
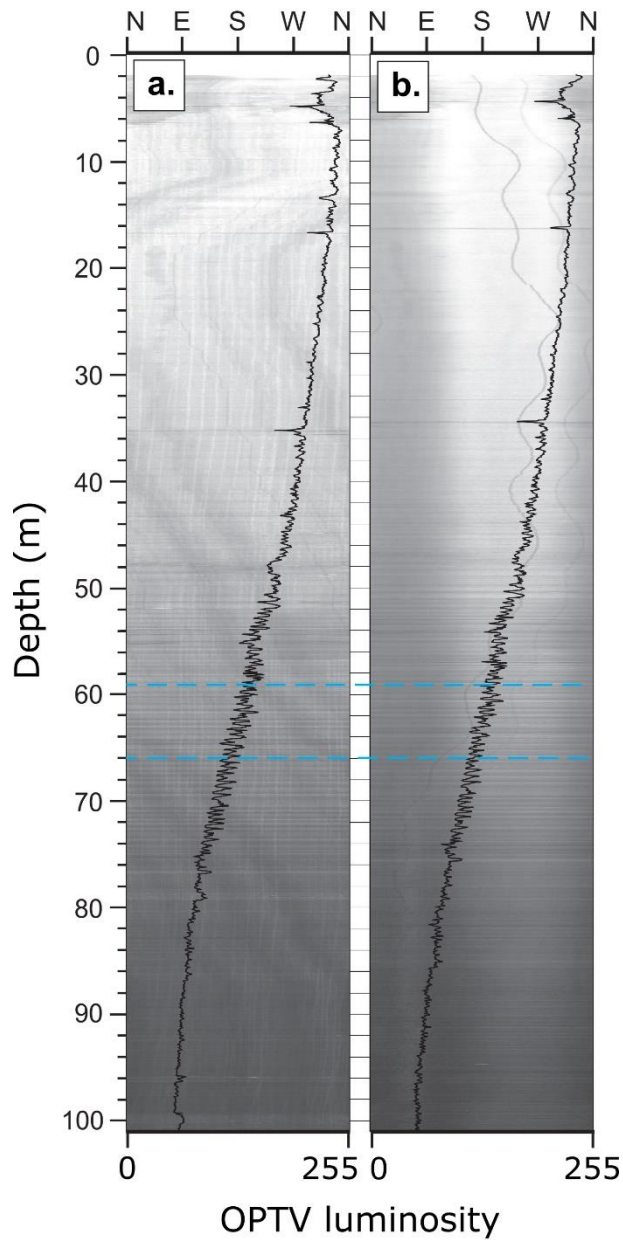
OPTV view



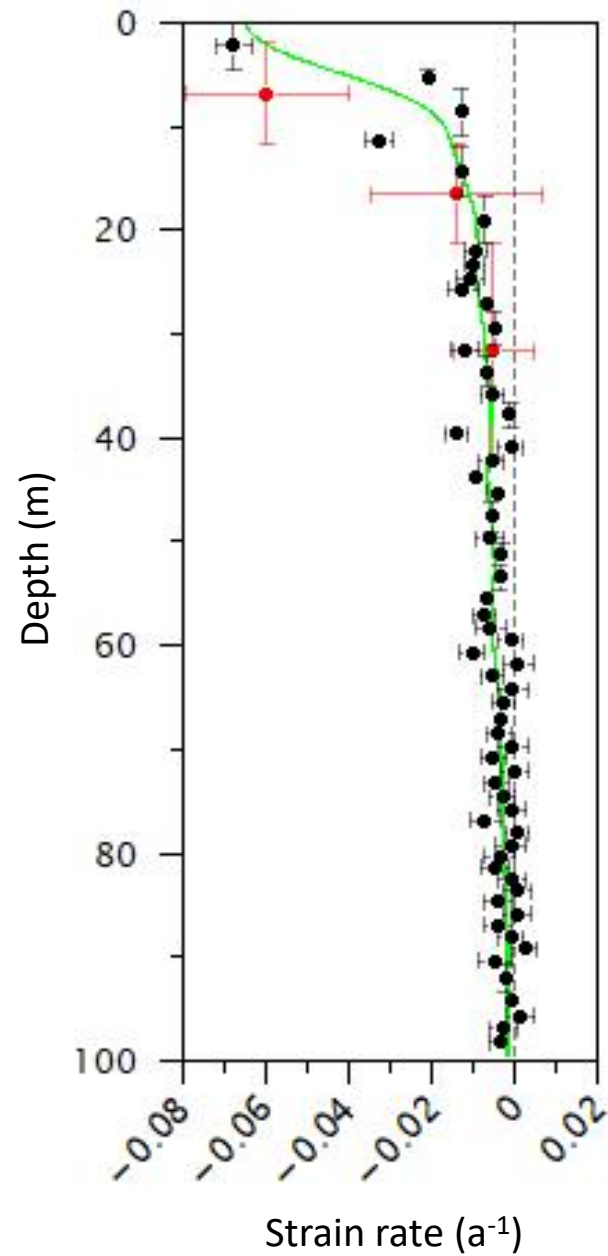
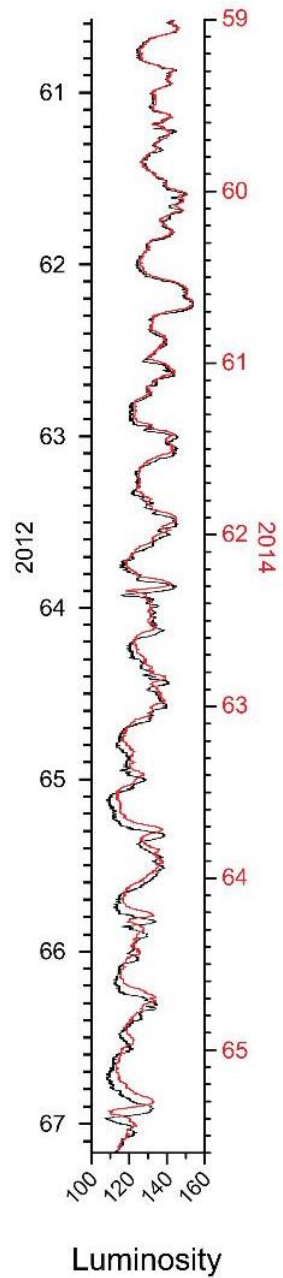
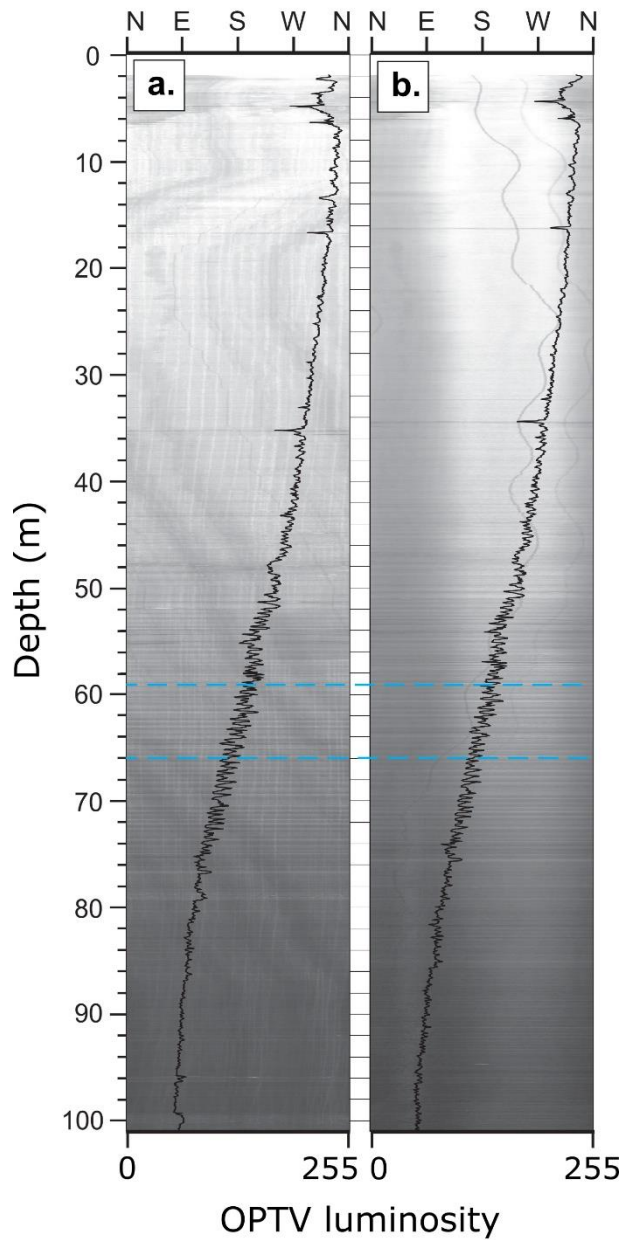
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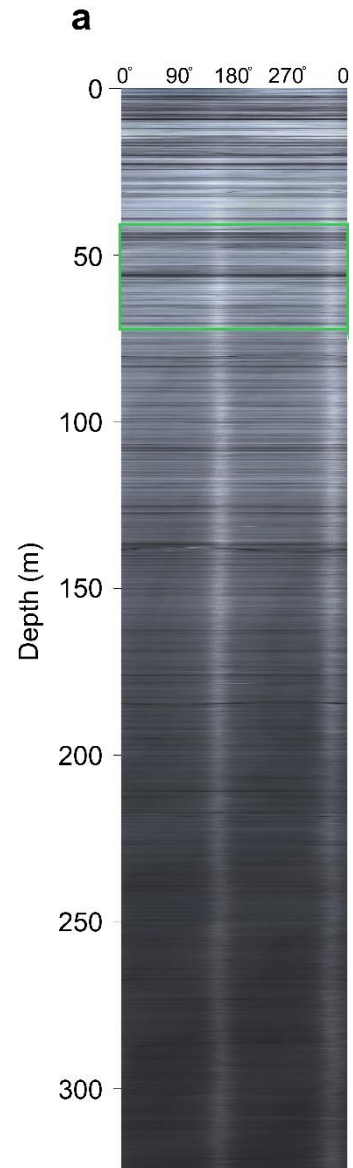
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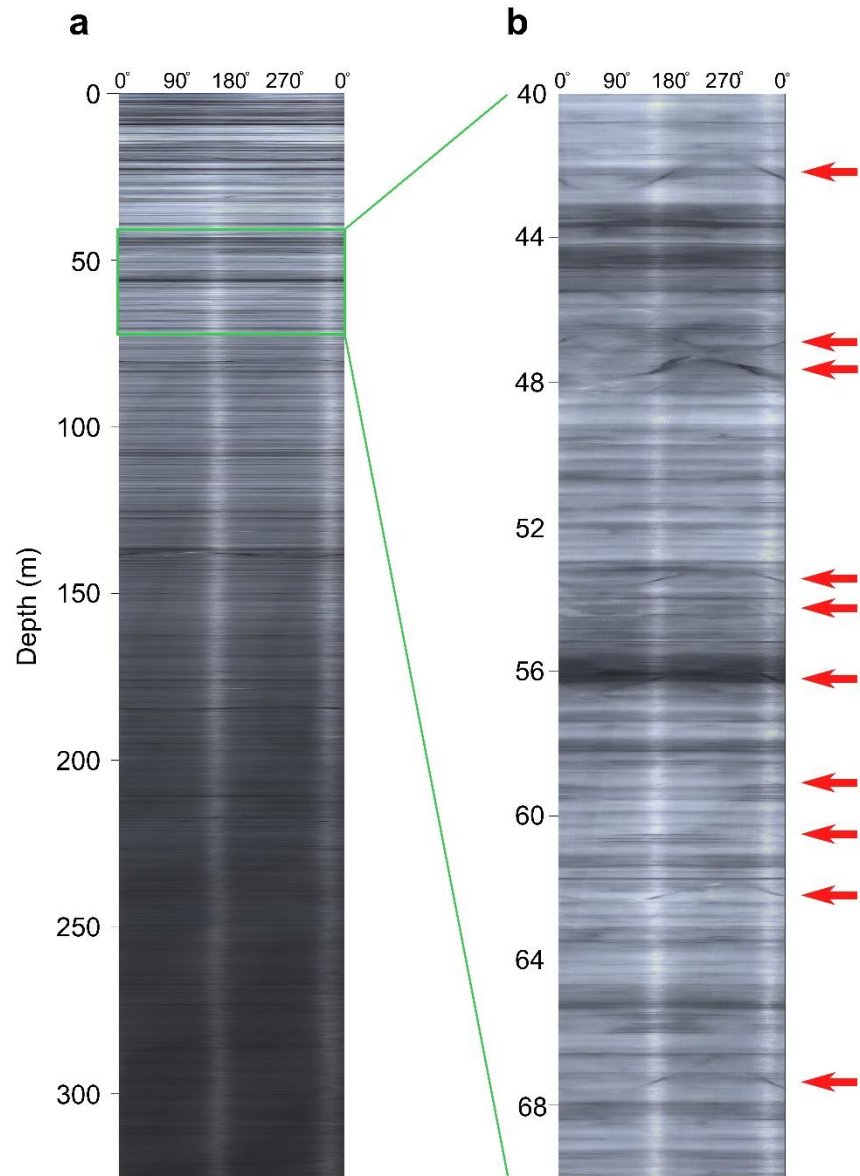


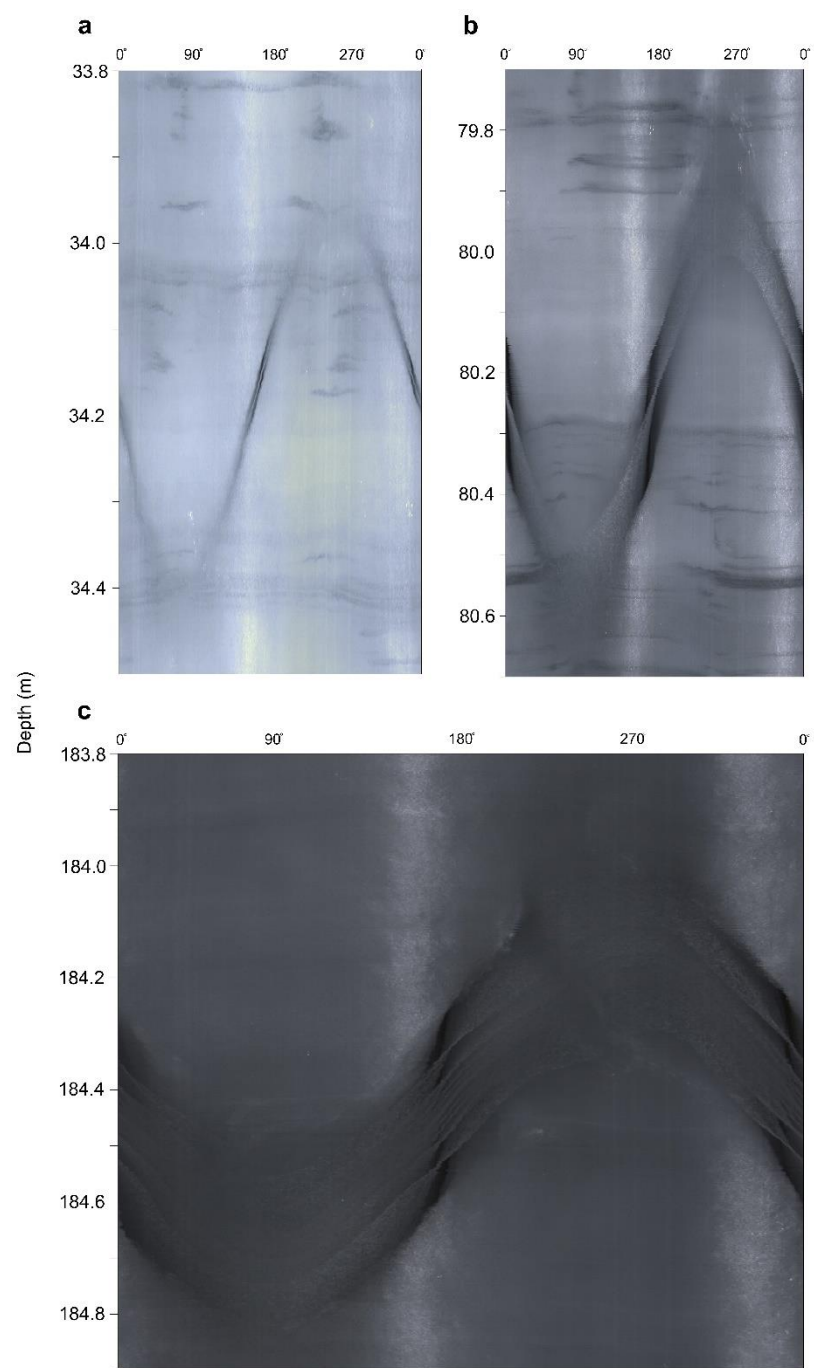
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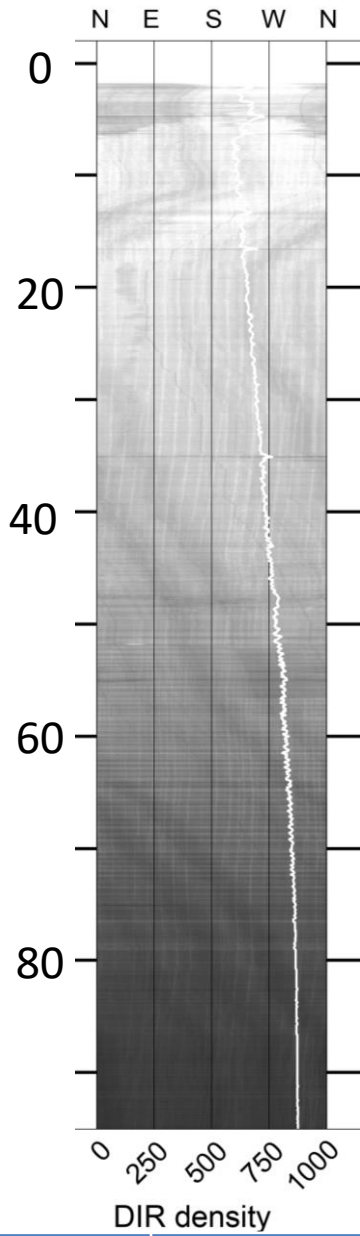


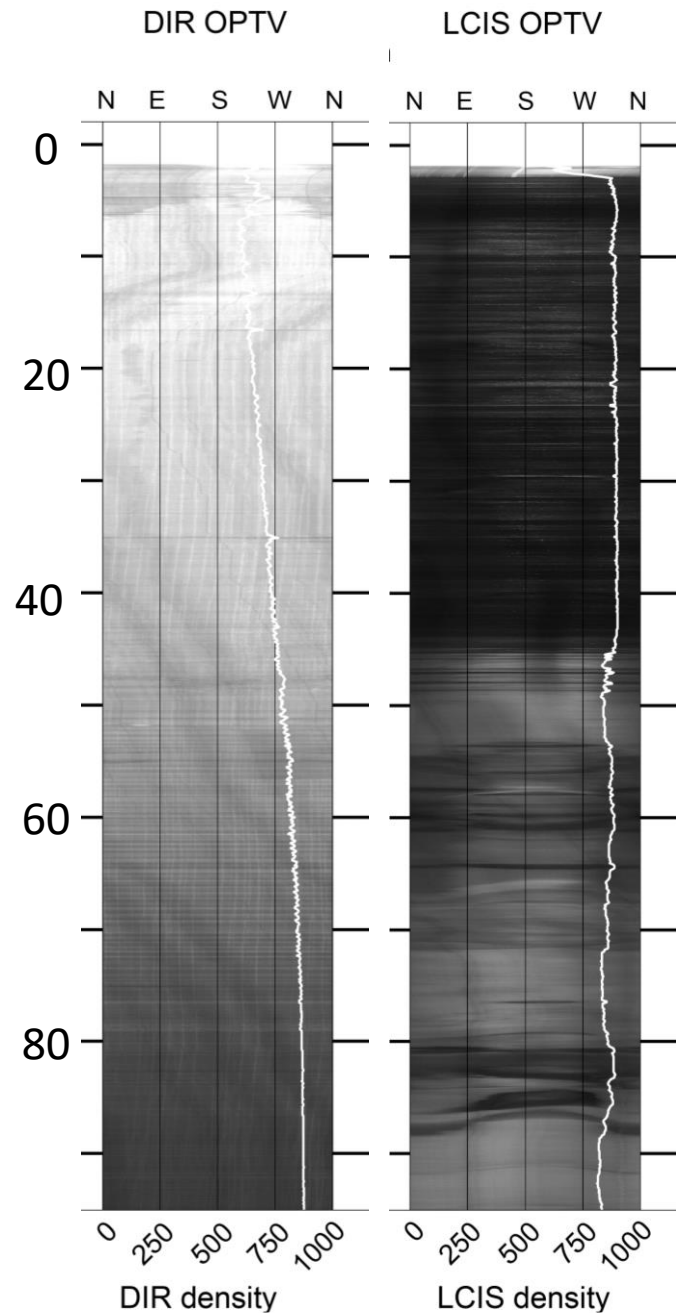
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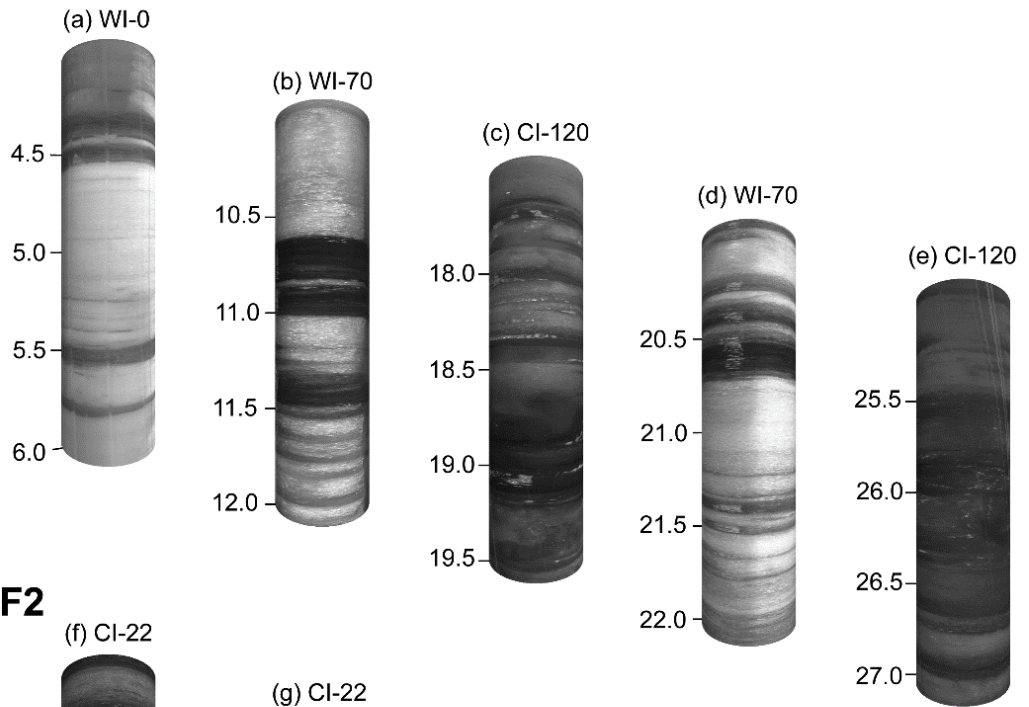
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DIR OPTV

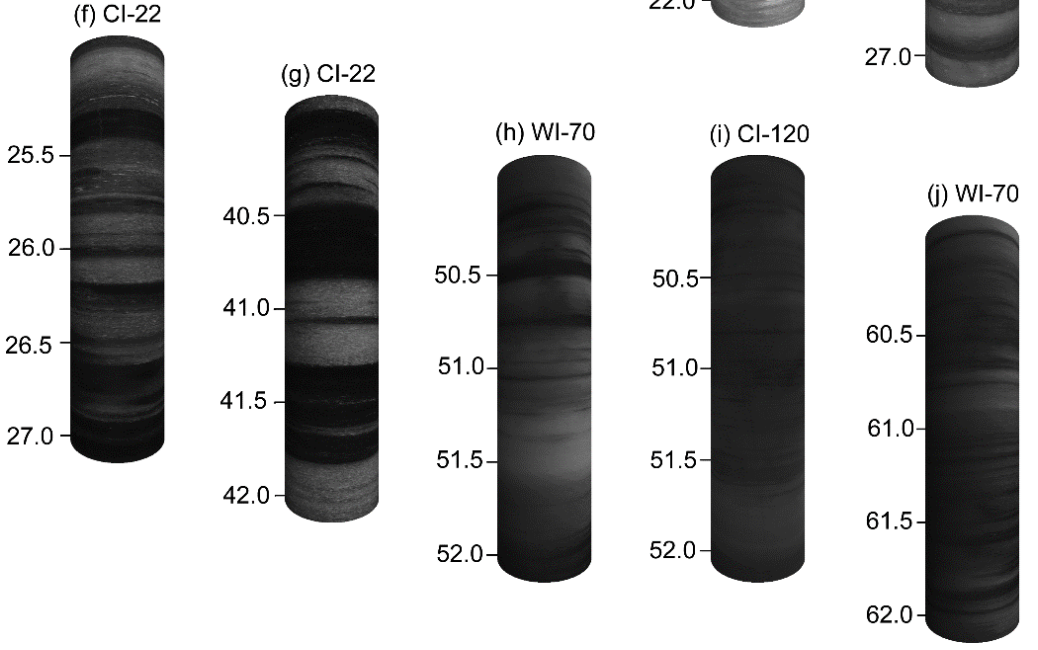




F1



F2



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OPTV of ice-mass boreholes

IceCube potential

- Annual layer tracking
- Age-depth scale
- Infiltration ice layers
- Density profile
- Dust layers
- Structures (fractures?)

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- Logging multiple boreholes allows spatial variability in all of above
 - Complementary to other studies

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- Needs open (unfrozen) borehole...