

# From clothing to atmospheric fallout: characterising direct microplastic fibre emissions in air

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## INTRODUCTION

- Clothing releases a substantial amount of fibres into the air during normal wear (De Falco et al. (2020)).
  - Microplastic fibres are bio-persistent, have toxic effects on humans and animals and can induce respiratory health problems (Chen et al. (2022)).
- The shape of microplastic particles has a crucial influence on the long range transport of particles (Tatsii et al. (2024)).

## KNOWLEDGE GAP

- There is a lack of research on direct microplastic fibre emission into the atmosphere.
- The release of airborne microplastic fibres from wearing clothing is highly under-researched, specifically research on natural-synthetic blends.

## RESEARCH QUESTIONS

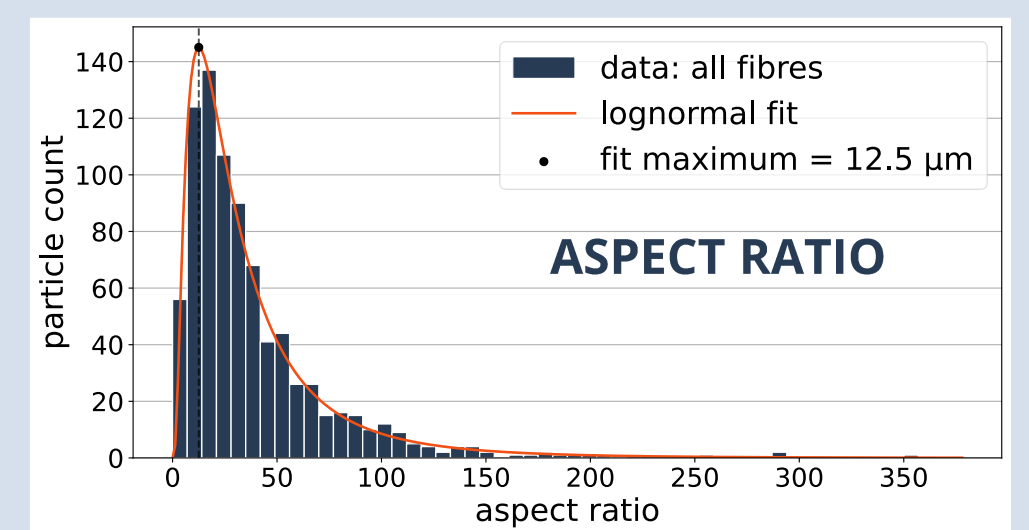
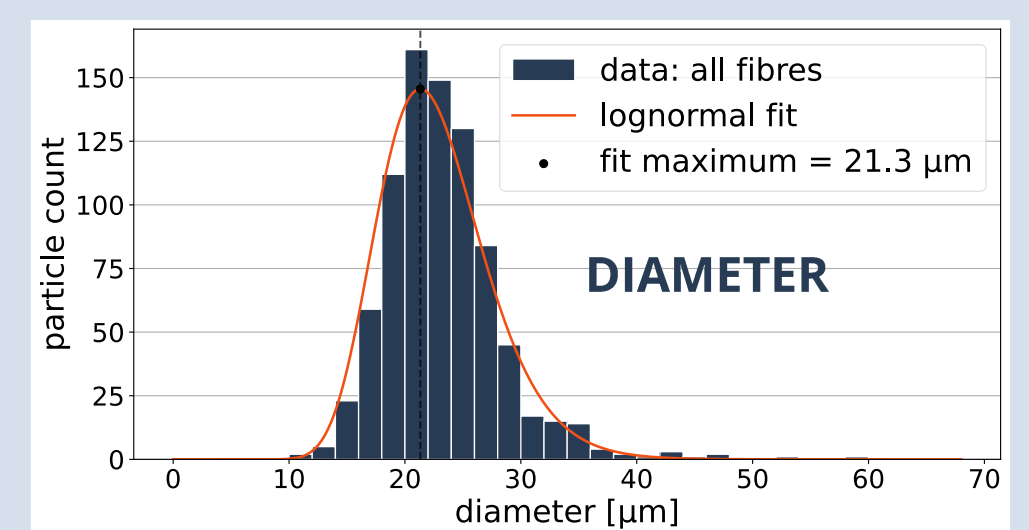
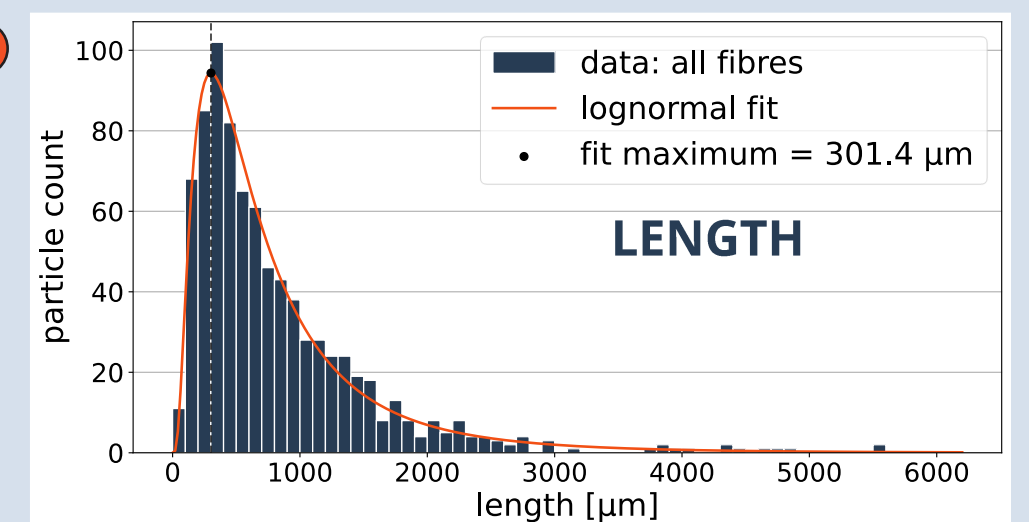
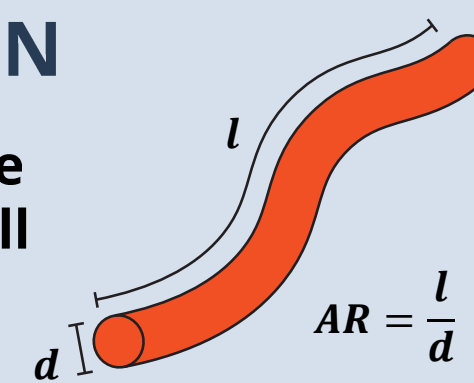
How many microfibrils are shed by wearing clothing?

Is there any influence of garment age on the amount of released fibres?

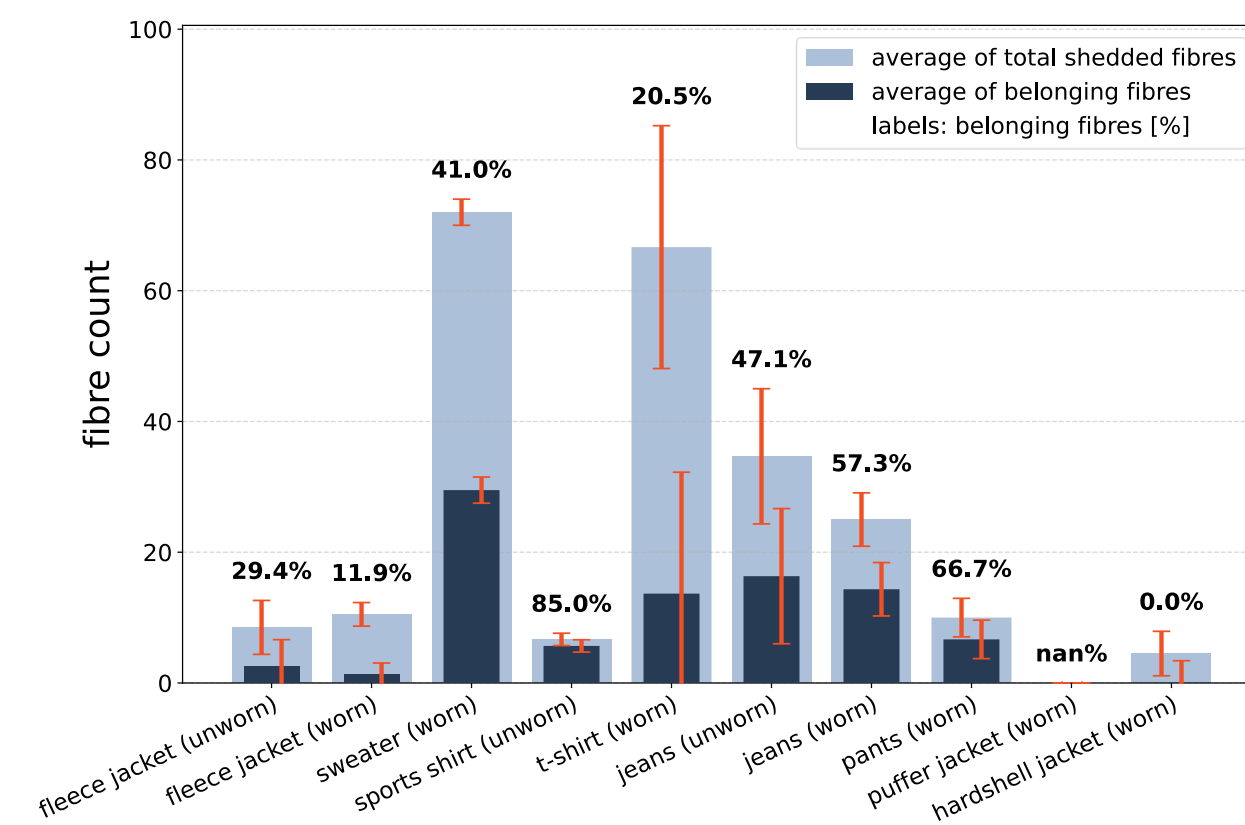
## RESULTS AND CONCLUSION

### SIZE DISTRIBUTION

Size distributions for the length, the diameter and the aspect ratio for all fibres are analysed (690 total).



### FIBRE ORIGIN



Only a fraction of measured fibres stem from the tested garment. The majority originate from fibres of other textile sources attaching to the tested garment (e.g. through laundering processes or clothing storage).

## METHODS

### CLOTHING SELECTION

- Testing both 100% synthetic clothing and mixed blends (synthetic-natural fibre blends).
- Focus on the influence of different garment ages.

### FRICIONING PROCESS

- Shedding is tested by gently rubbing clothes together.
- Frictioning for 60s + stroke count.
- Testing: 10cm above 5cm x 5cm grid.

### IMAGING PROCESS

- DARWIN M2 Digital Microscope (Beaverlab).
- Saving images of all fibres.

### DATA ANALYSIS

- Fiji software for length and diameter measurements.
  - Calculation of aspect ratio.
- Distinction of fibres by colour.

## TAKE HOME MESSAGE

- Only 44% of shedded fibres stem from the tested clothing piece.
- No significant differences in the shedding behaviour of garments with different ages could be found → further testing needed.

## WHAT'S NEXT?

### EXPERIMENTAL WORK

Experiments to quantify emission factor and dispersion (ongoing).

### FTIR ANALYSIS

Determining the fraction of microplastic versus natural fibres through FTIR analysis (ongoing).

### ACKNOWLEDGEMENTS

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### REFERENCES

Chen et al. (2022)  
De Falco et al. (2020)  
Tatsii et al. (2024)



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