AFModulus_Flex

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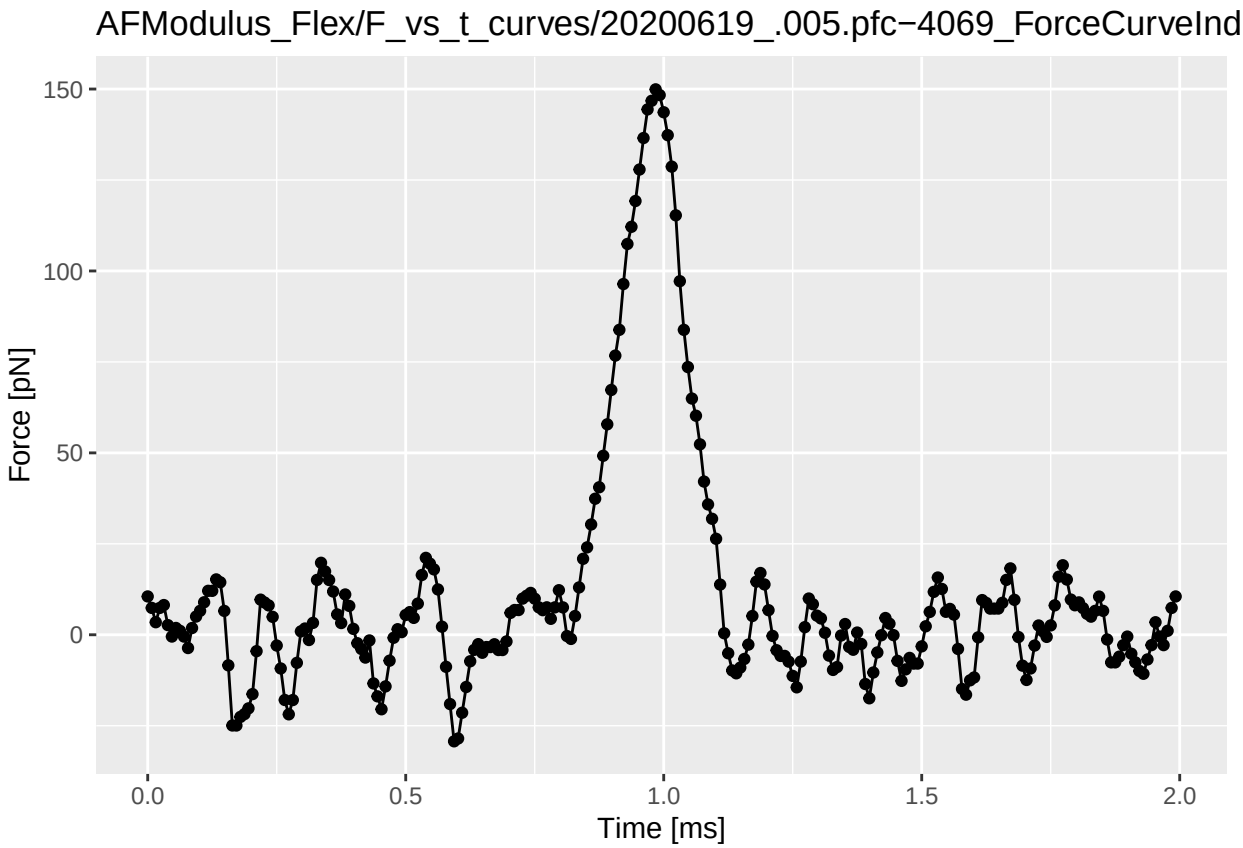
1/11/2021

Atomic Force Microscopy - From Topology to Stiffness (Modulus)

The git page of this project can be found here https://github.com/audreyyeoCH/AFModulus_Flex.

Import of AFM curves (force vs. separation distance) for each pixel



Plot 1 curve

We will use the force signal between time 0.0 - 0.5 ms as well as 1.5 - 2.0 ms as **baseline**.

We will use a sliding window approach to approximate the **gradient** of the linear slope within the time 0.5 - 1.2 ms.

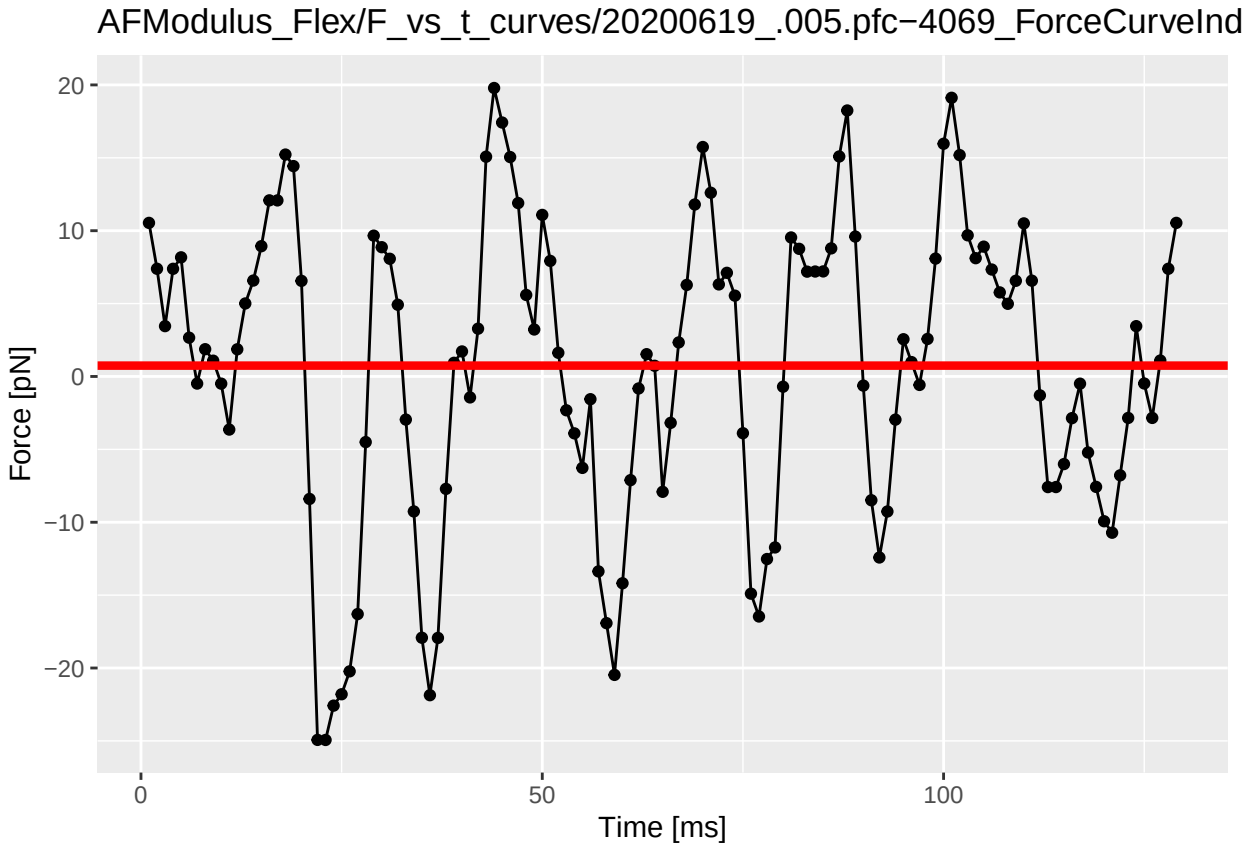
Extract maximal force (F max) from each graph

F max = 149.9152, the time of F max = 0.9843756.

Compute Contacting point

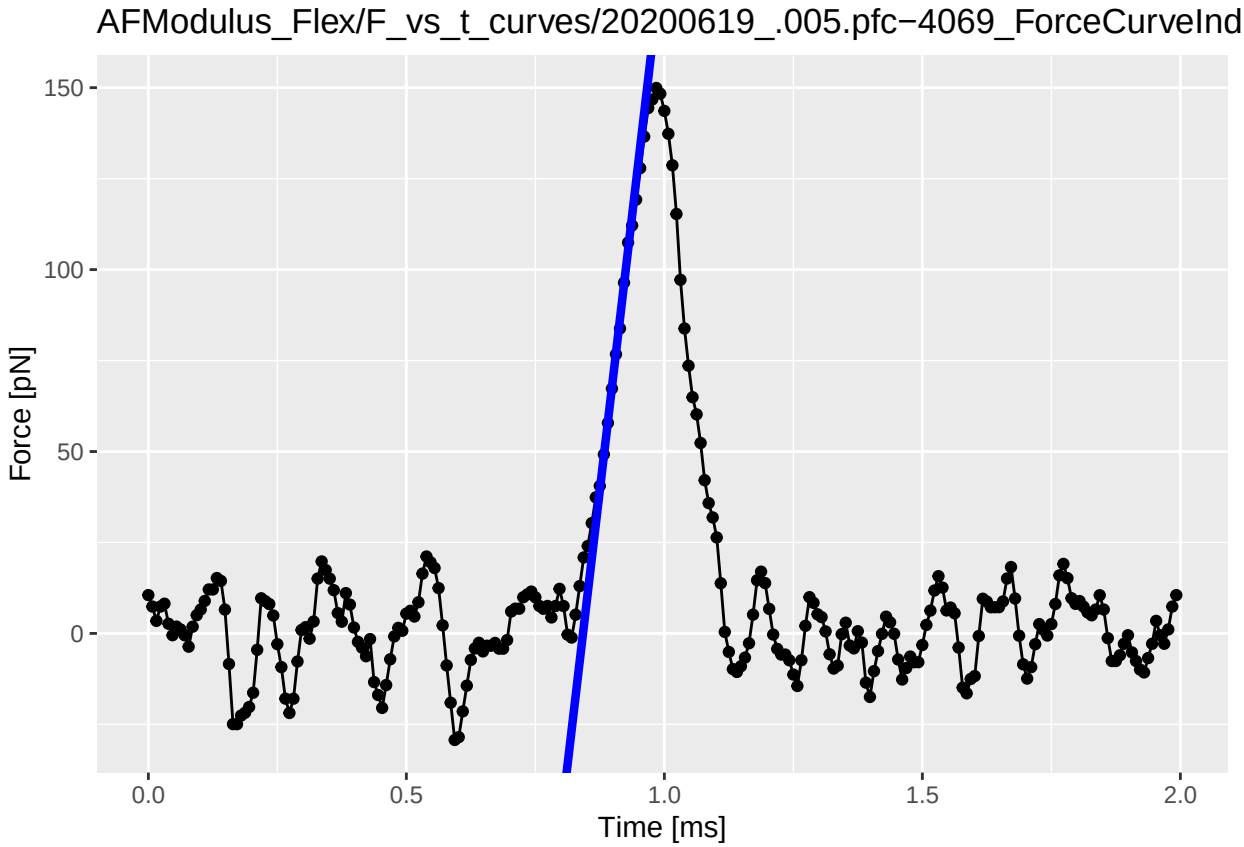
A) Intersect between baseline and linear gradient

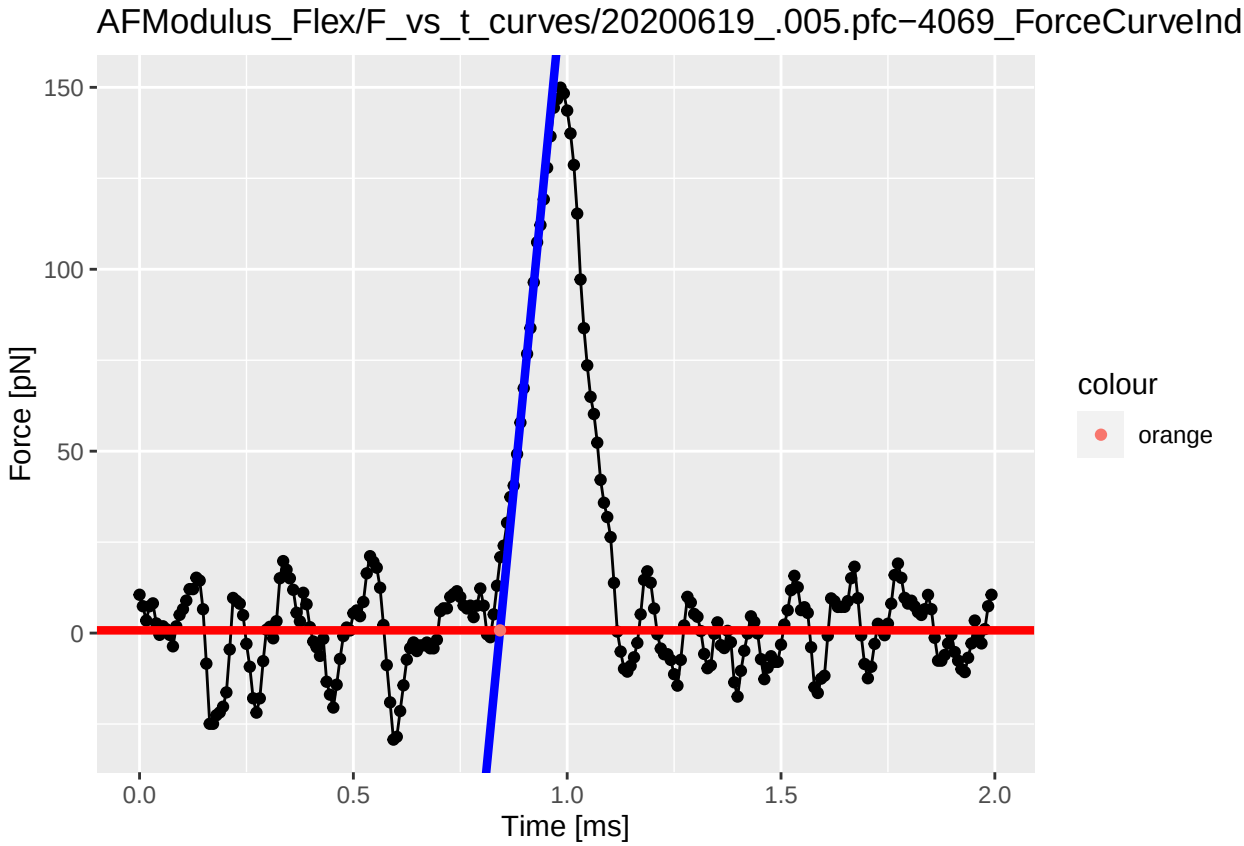
- We will use the force signal between time 0.0 - 0.5 ms as well as 1.5 - 2.0 ms as **baseline**.
- We will use a sliding window approach to approximate the **gradient** of the linear slope within the time 0.5 - 1.2 ms.




```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```


AFModulus_Flex/F_vs_t_curves/20200619_.005.pfc−4069_ForceCurveInd
150
100
50
0
Force [pN]
0.0
0.5
1.0
1.5
2.0
Time [ms]


AFModulus_Flex/F_vs_t_curves/20200619_.005.pfc−4069_ForceCurveInd
150
100
50
0
Force [pN]
0.0
0.5
1.0
1.5
2.0
Time [ms]
colour
orange

B) Intersect between baseline and parabular fit & comparison to linear fit intersect

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# Audrey
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C) Mean of error increase from baseline (= start of adhesion dent) and error from linear gradient (= end of adhesion dent)

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# suggested by Jörg Stelling
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Compute indentation depth (d) from Contacting point for each pixel

The indentation depth d = 3.30951 nm.

Compute modulus (= stiffness, E) for each pixel from F-max and d

The Young's modulus E = 14.6150214 [UNIT?].

Visualisation of the Young's Modulus

Print picture of topology

Print picture of stiffness

Error propagation/ sensitivity analysis of the modulus

Plot topology against modulus? Can this detect 'antibiotics affected areas'?