

Low Cost Renewable Energy

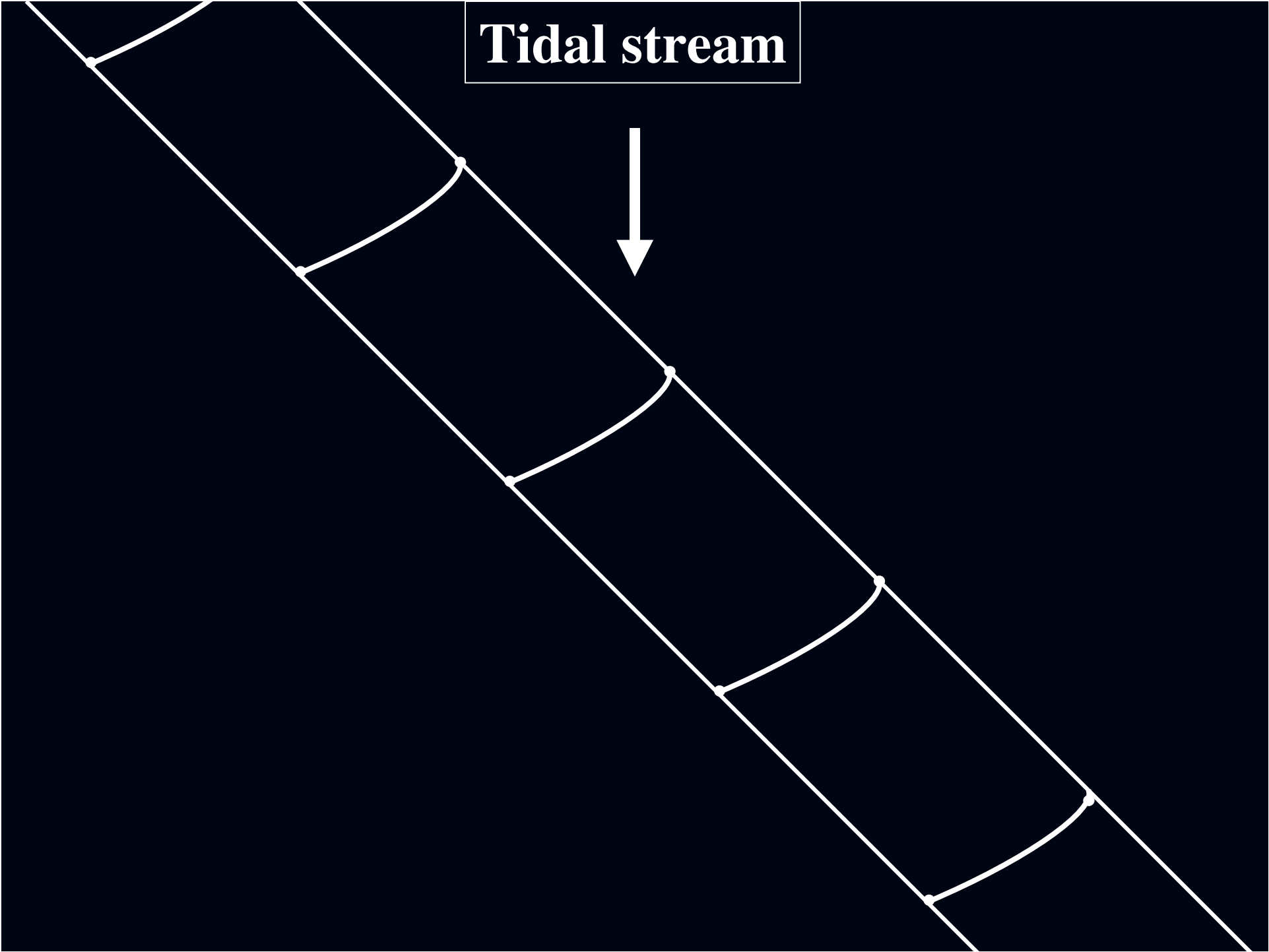
**by
Are Børgesen**

Tidal Sails

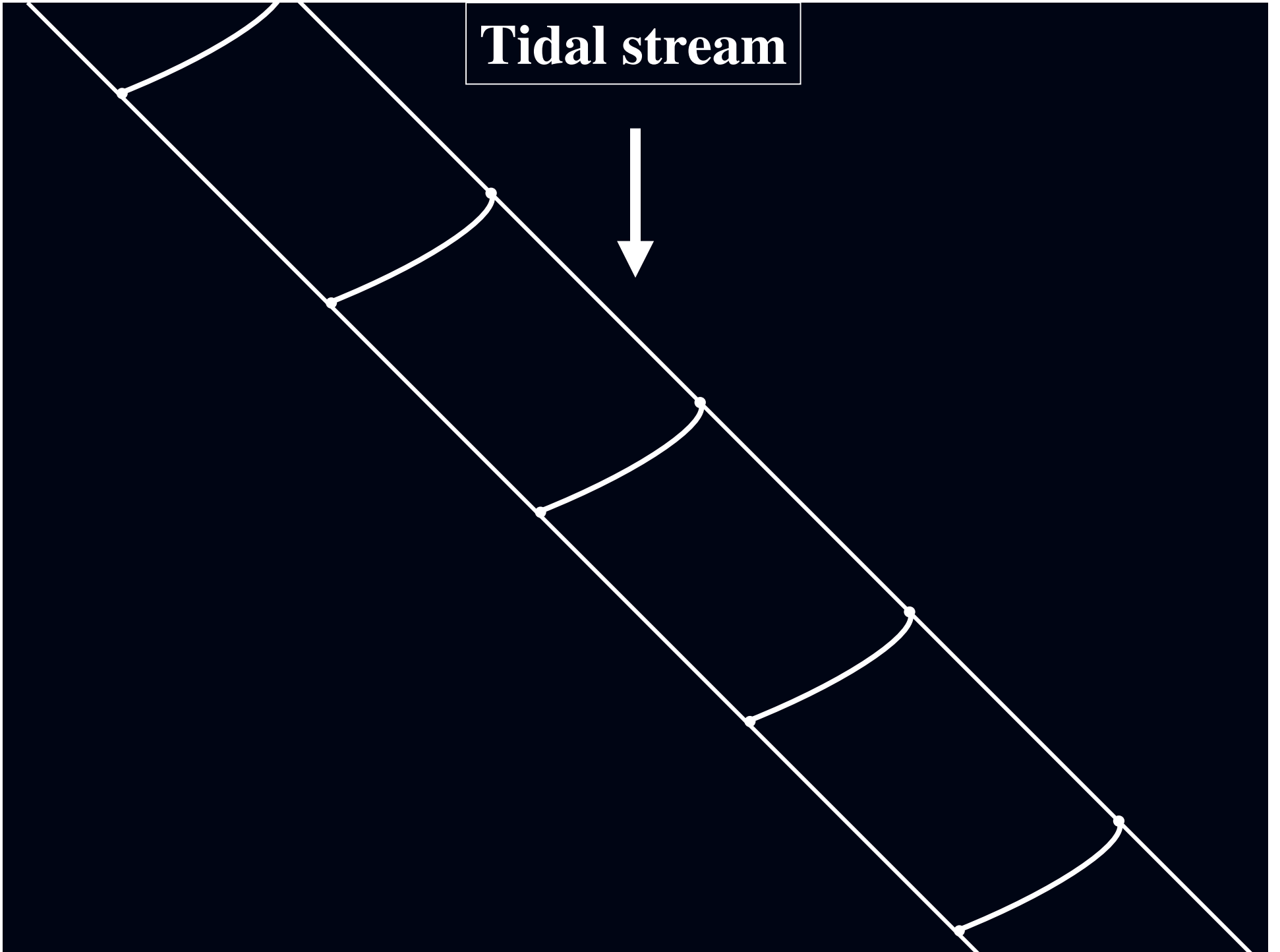
Tidal Sails

- **Are Børgesen /Managing Dir. (Inventer and Founder)**
- **Revolutionary Tidal Stream Power Plant!**
- **Clean and Low Cost Energy!**
- **Exclusive patent: PCT - approved March 2006!**
- **Tidal energy market estimated at € 1 trillion!**
- **Customers: Energy Companies in UK, USA, Can, SE Asia**
- **Capital need : € 2,5 mill Prototype financing**
- **High upside on ROI!**

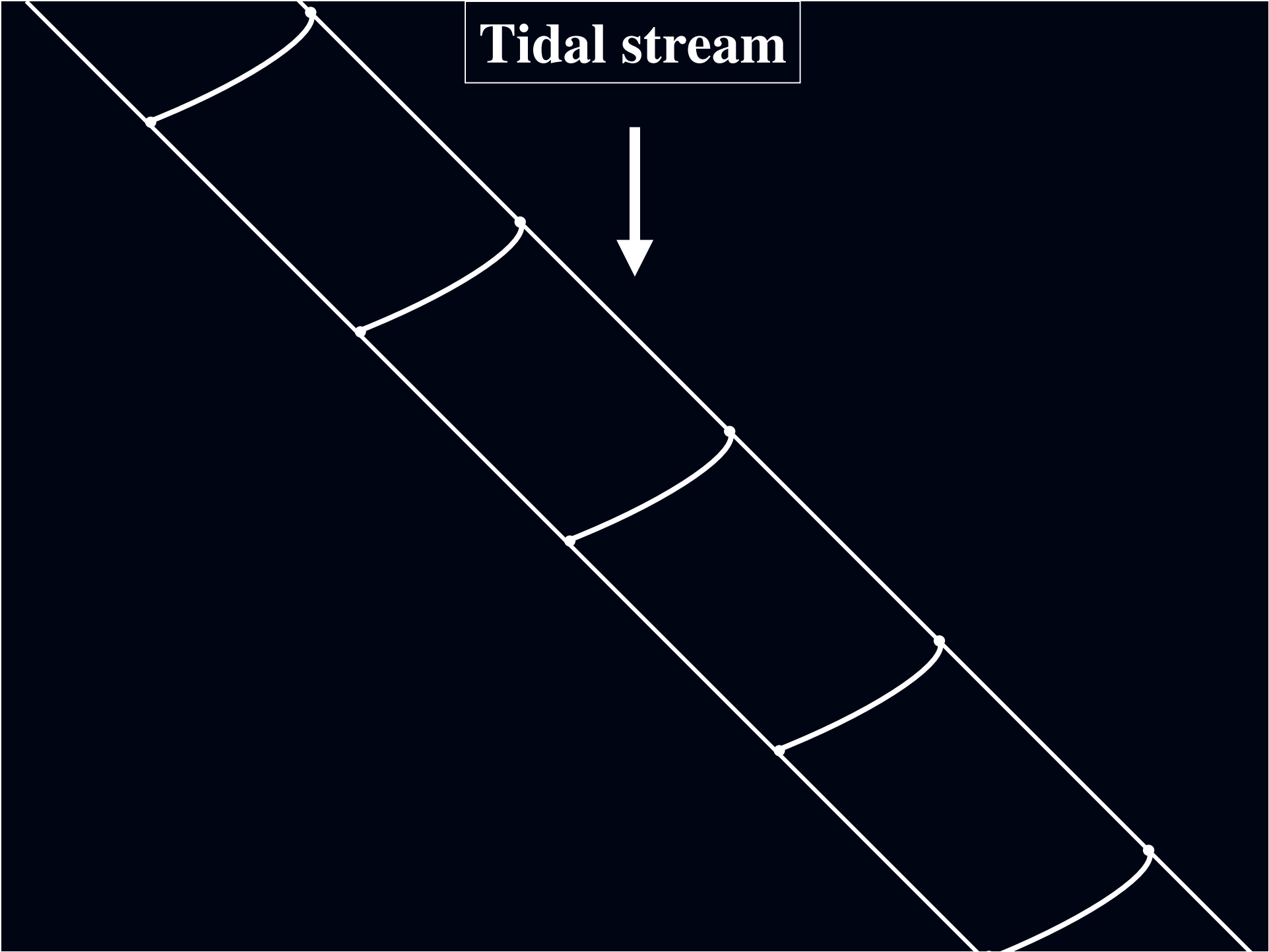
Tidal stream



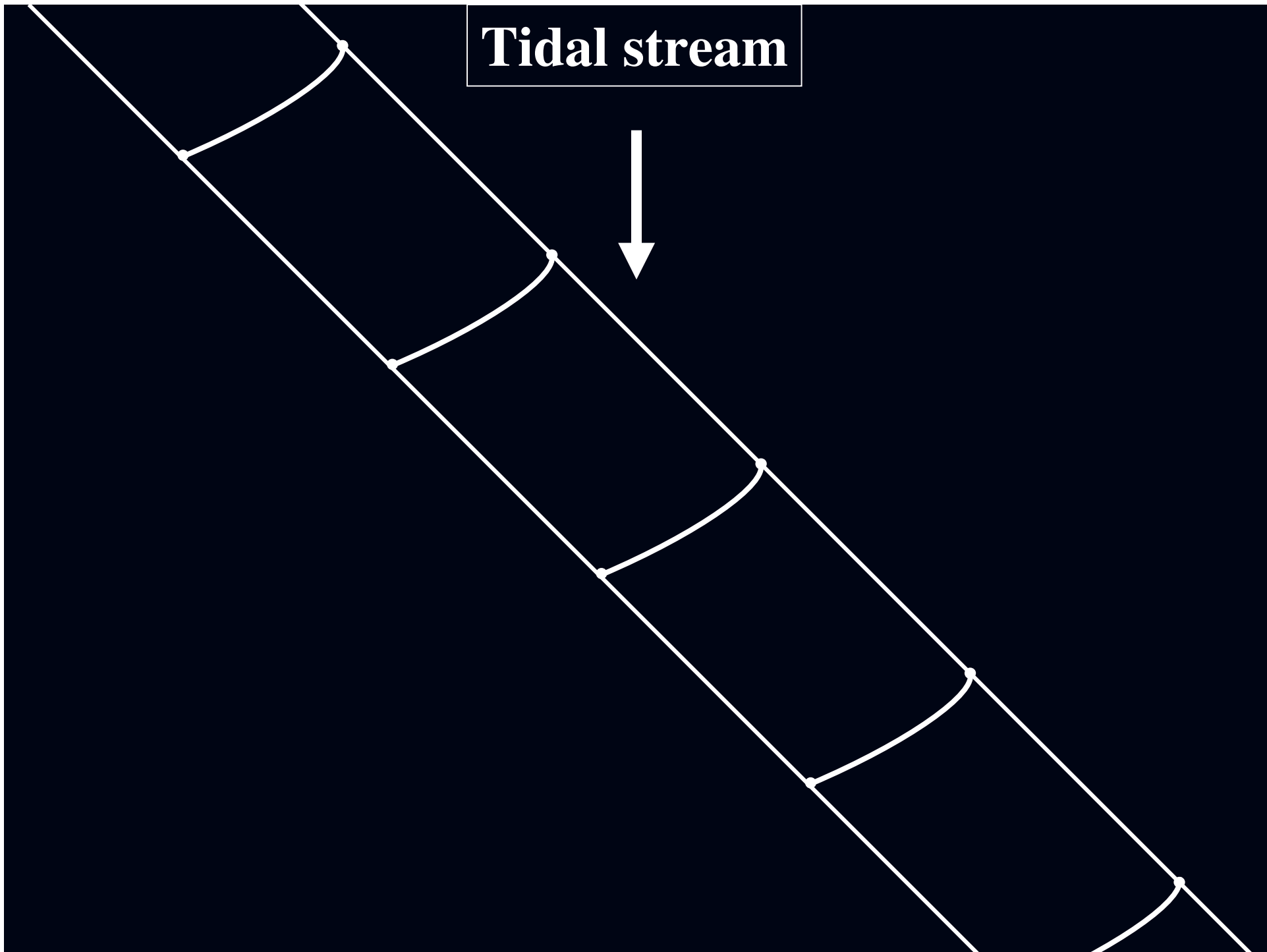
Tidal stream



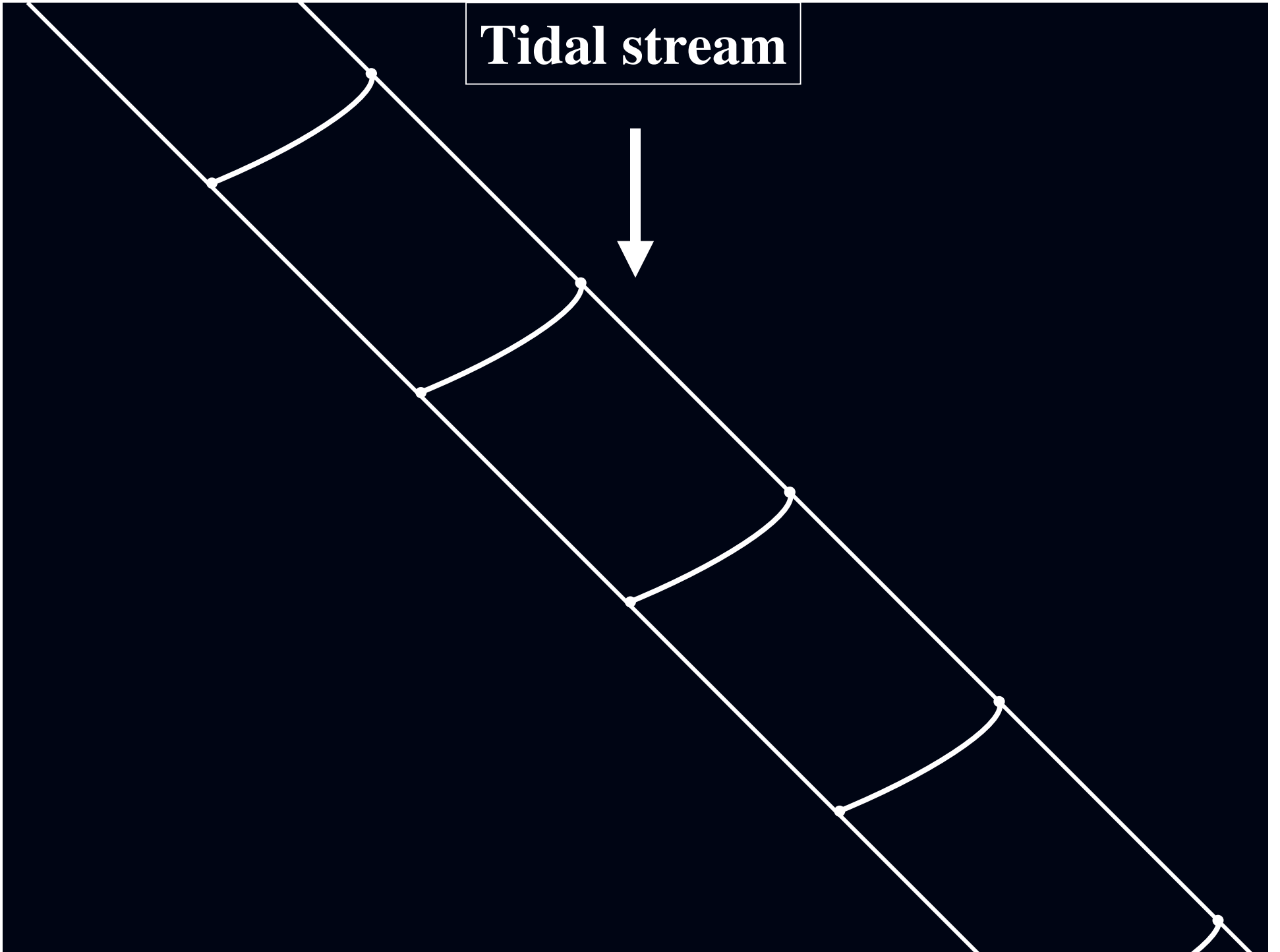
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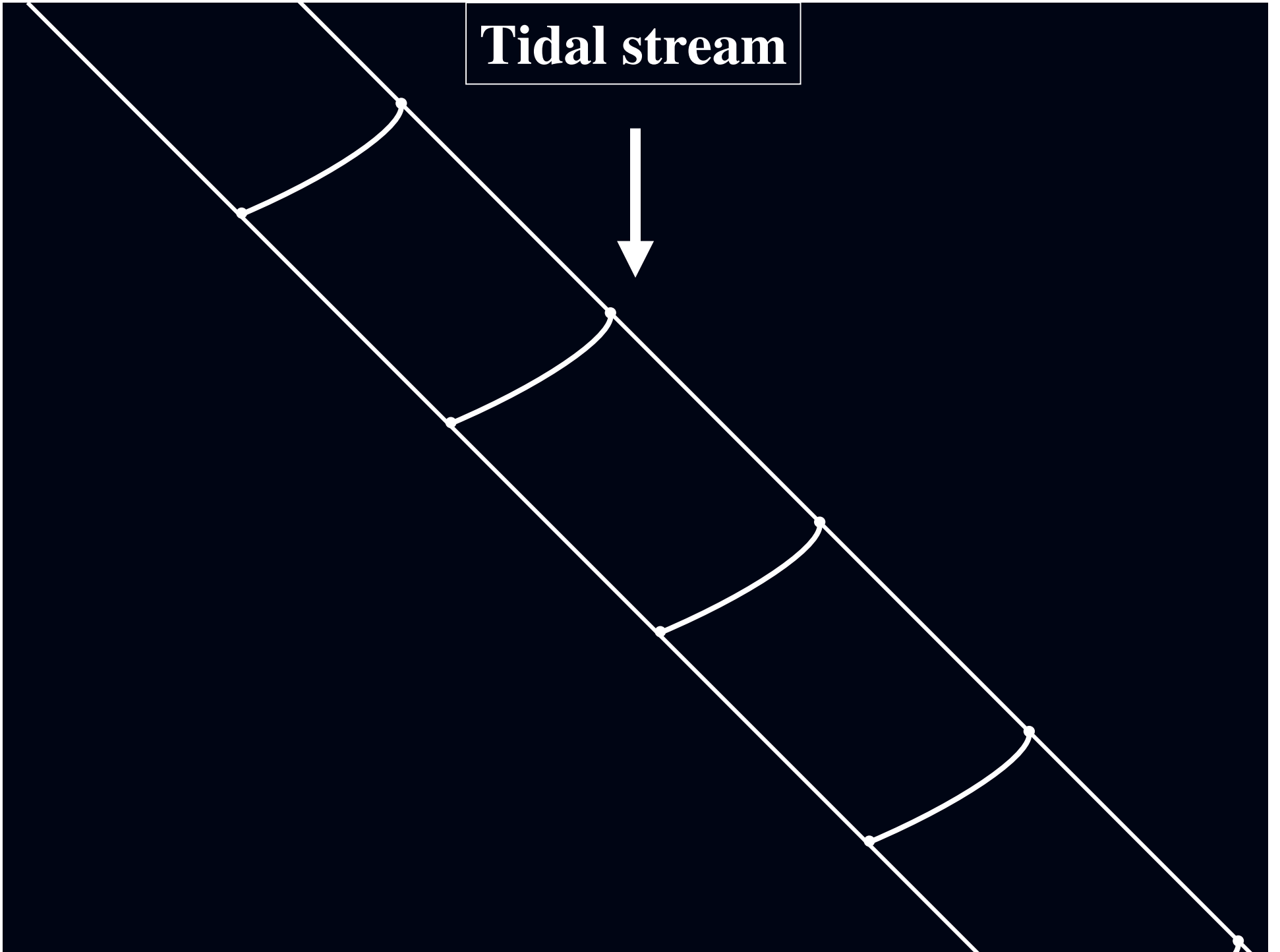
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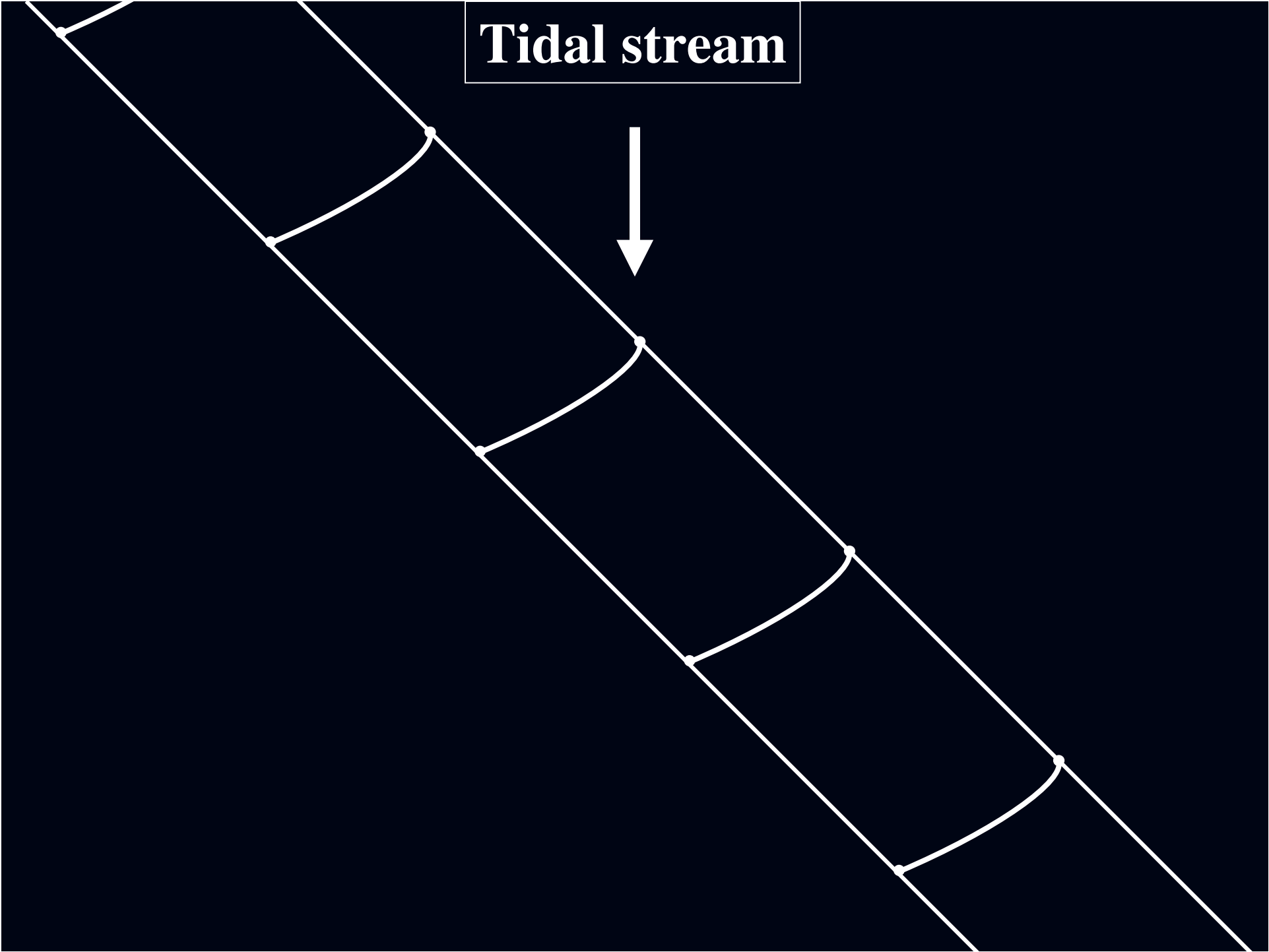
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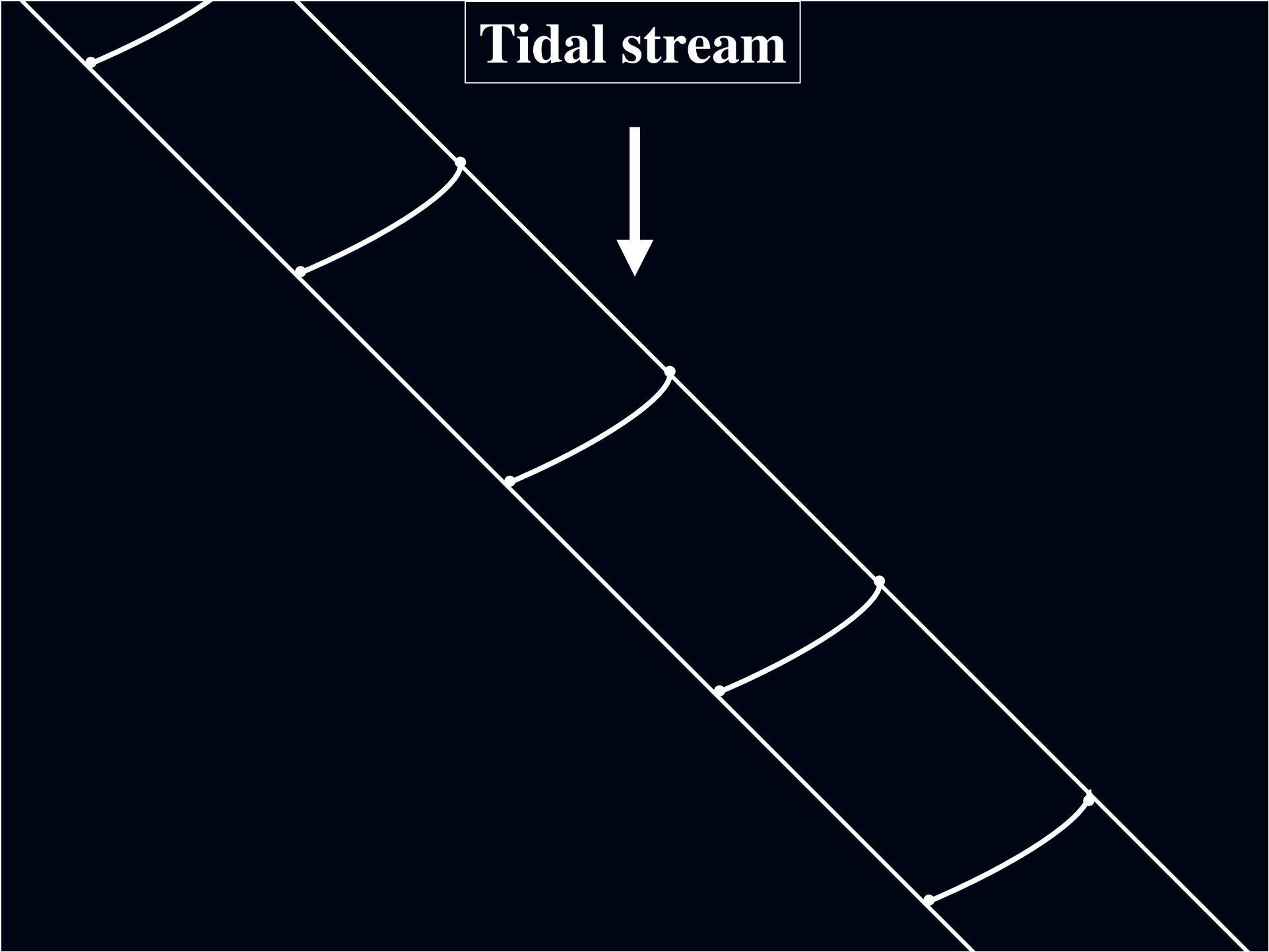
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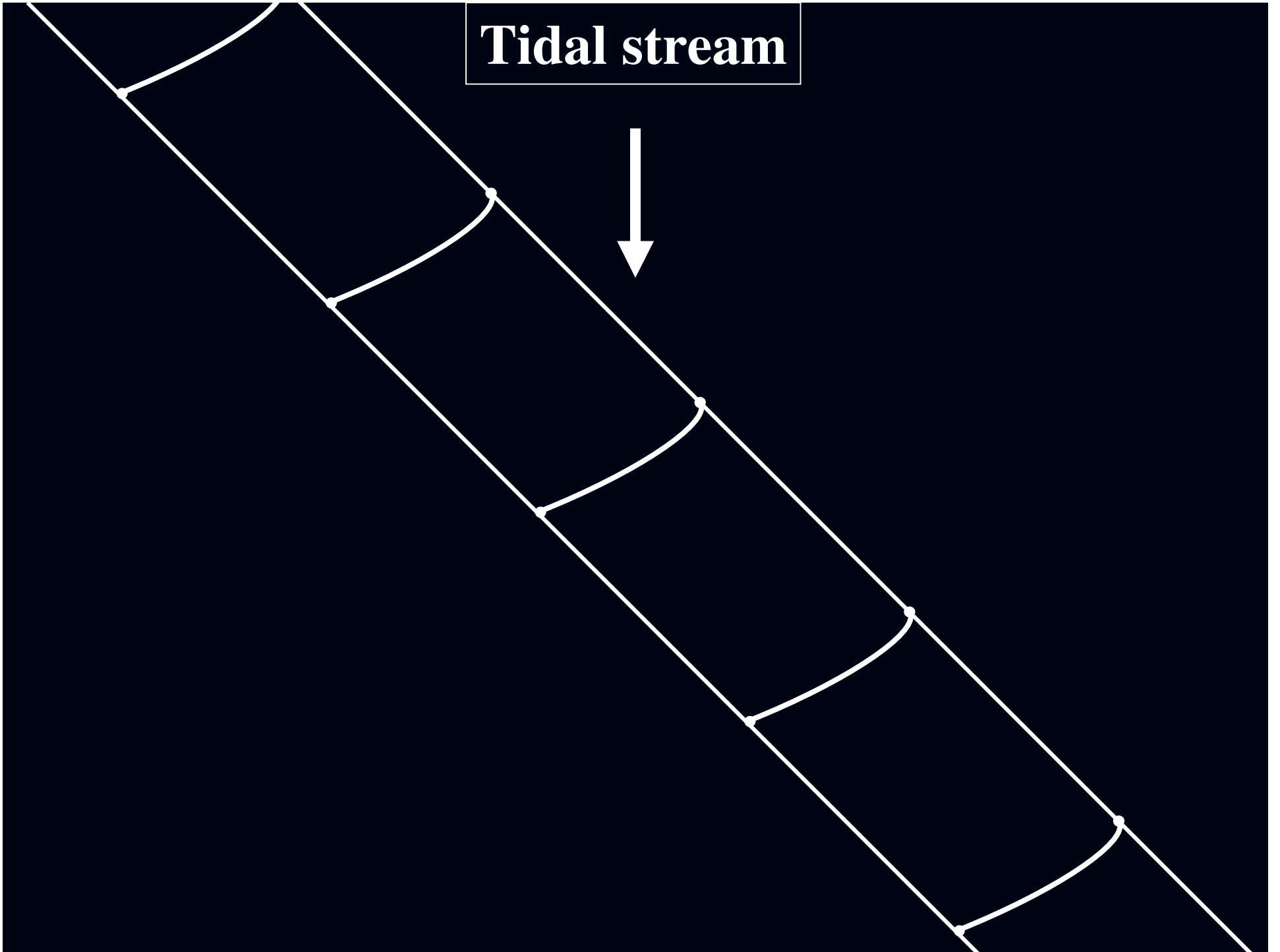
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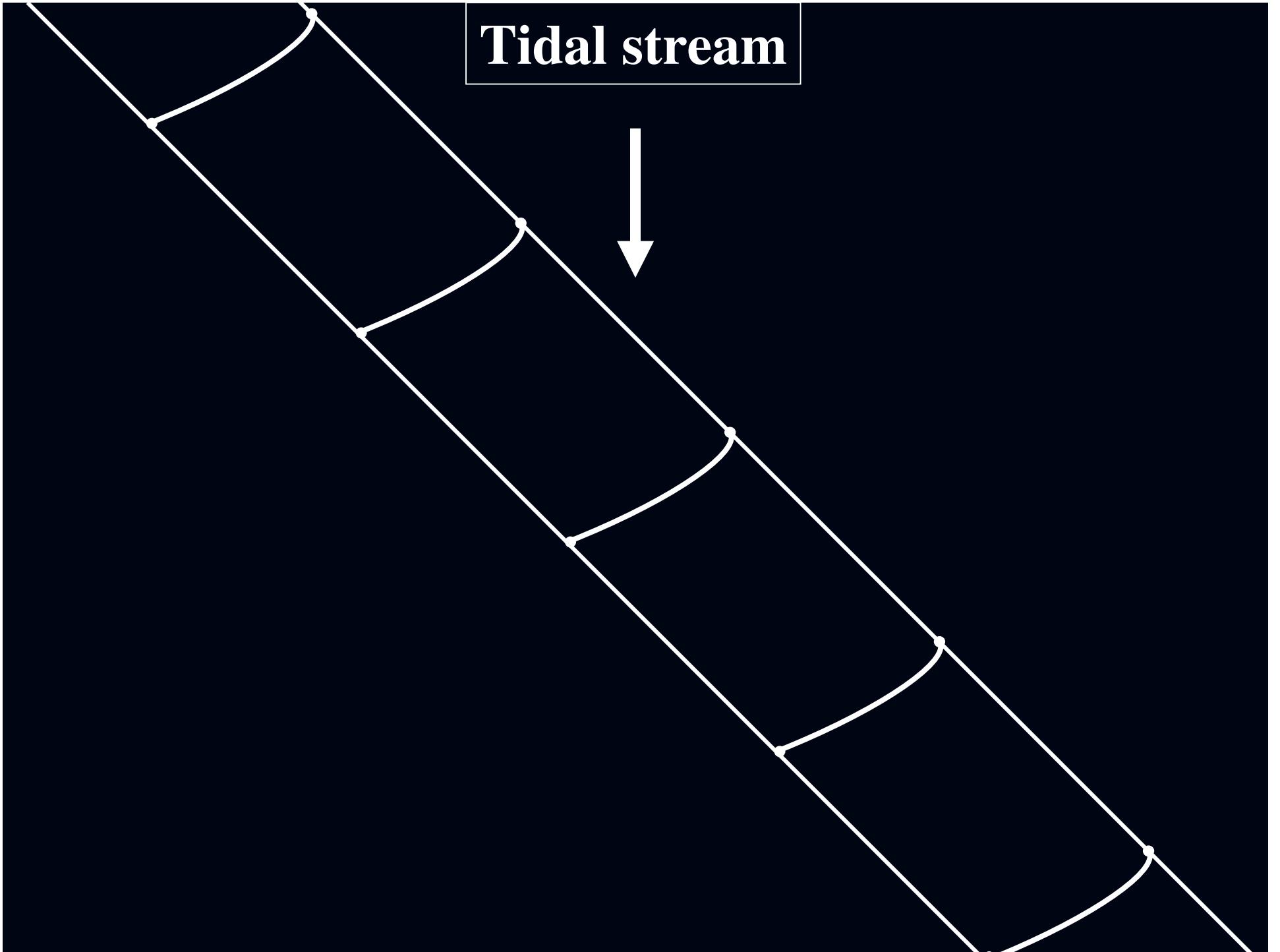
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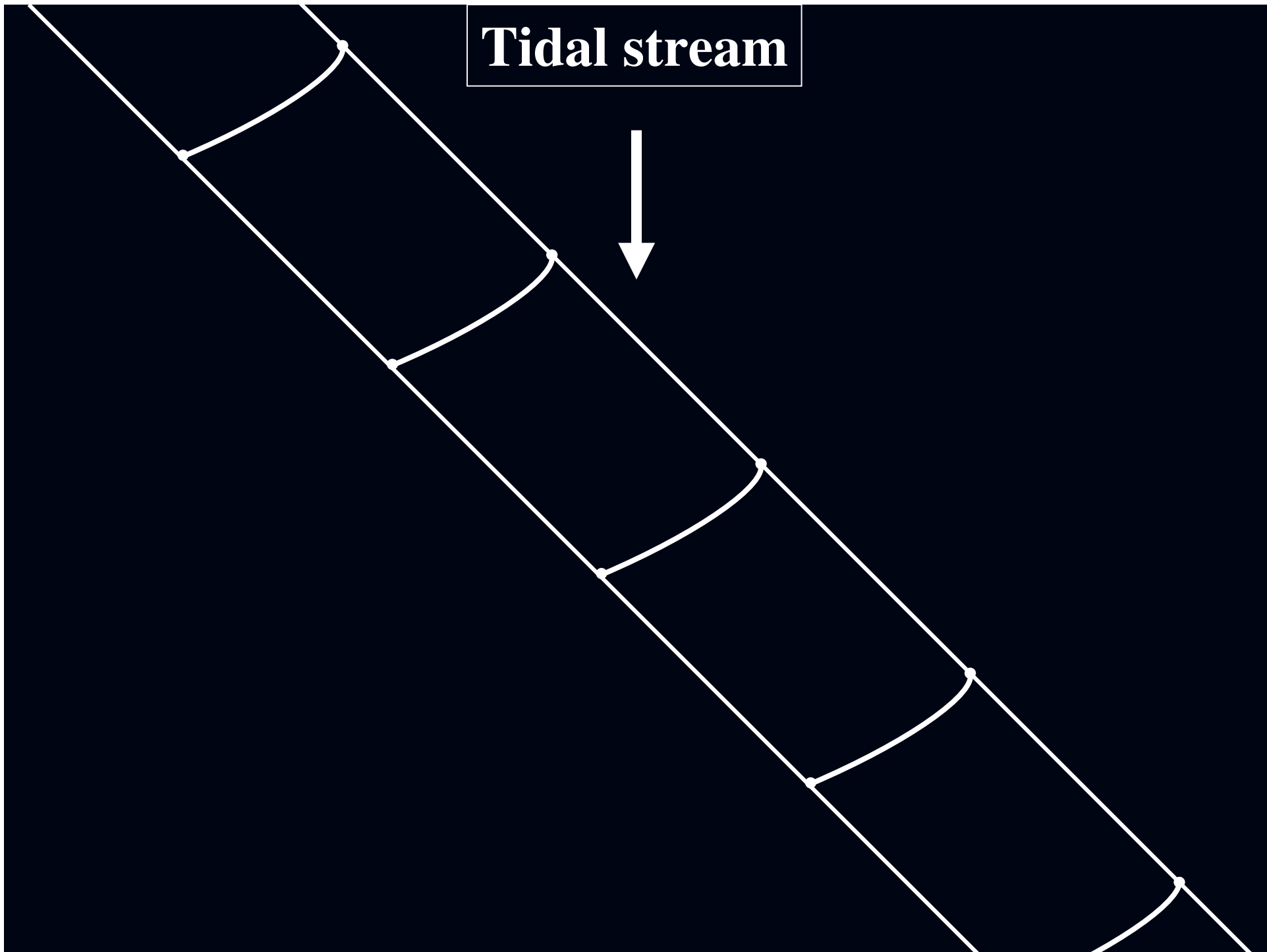
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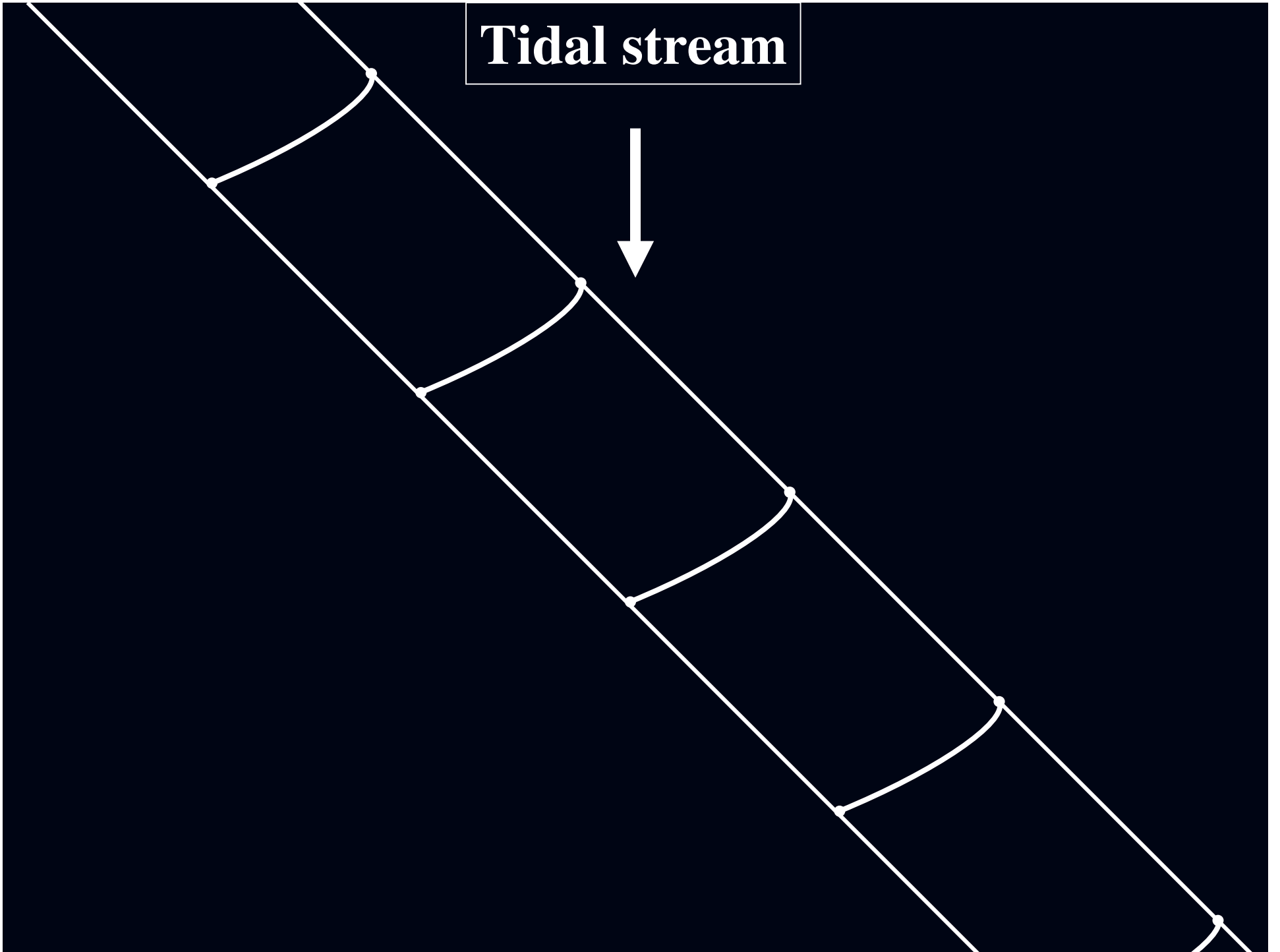
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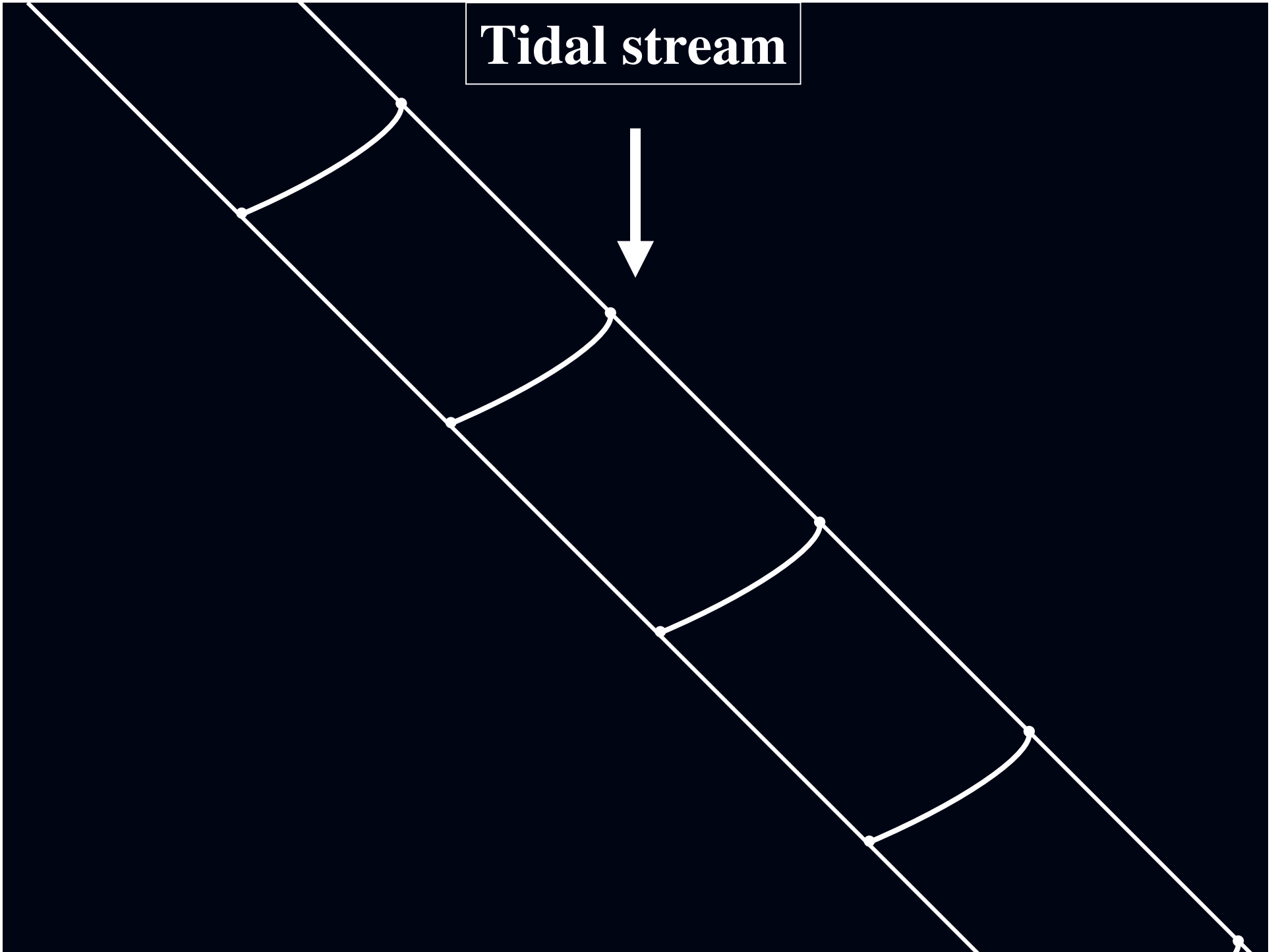
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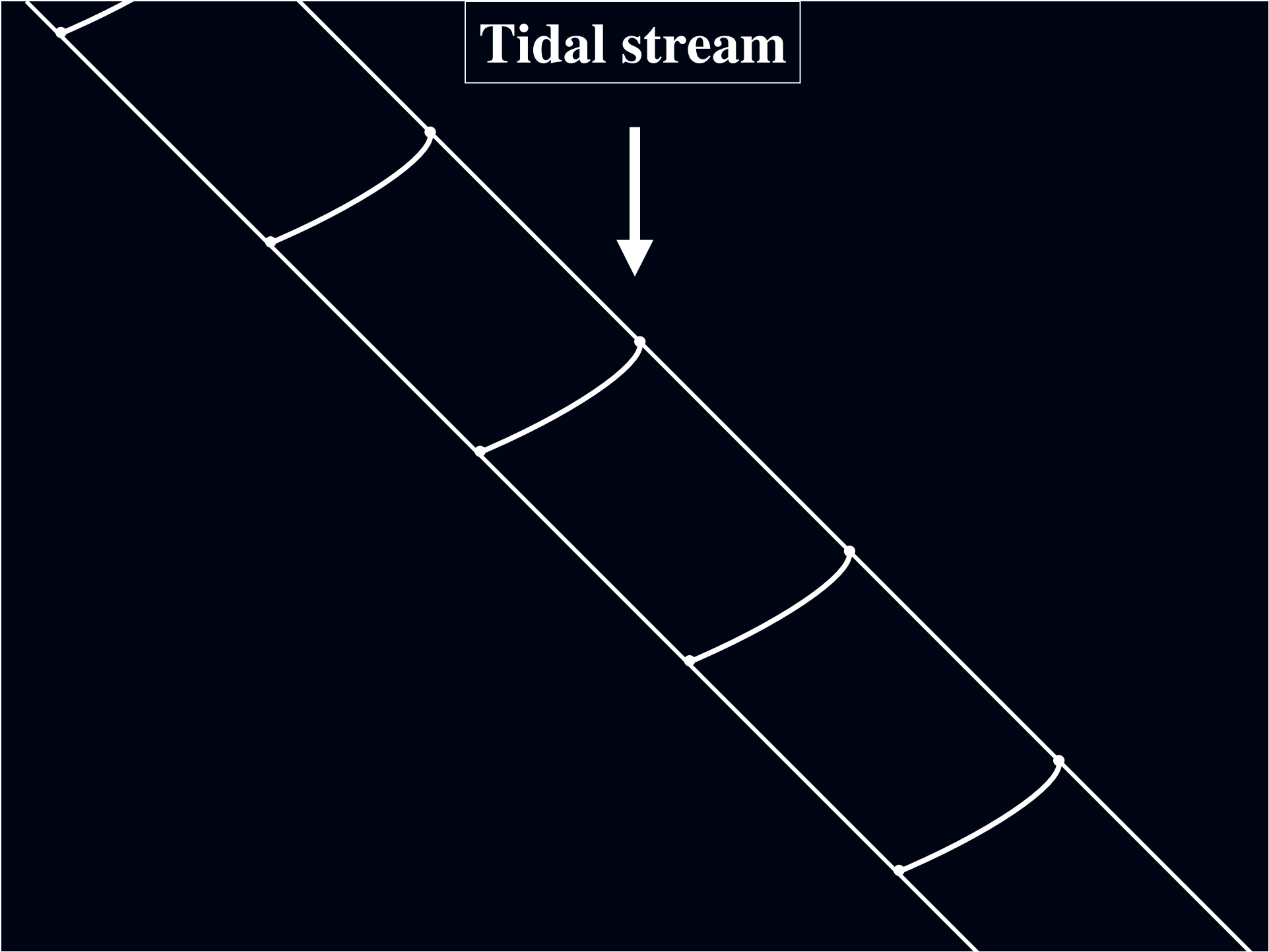
Tidal stream



Tidal stream

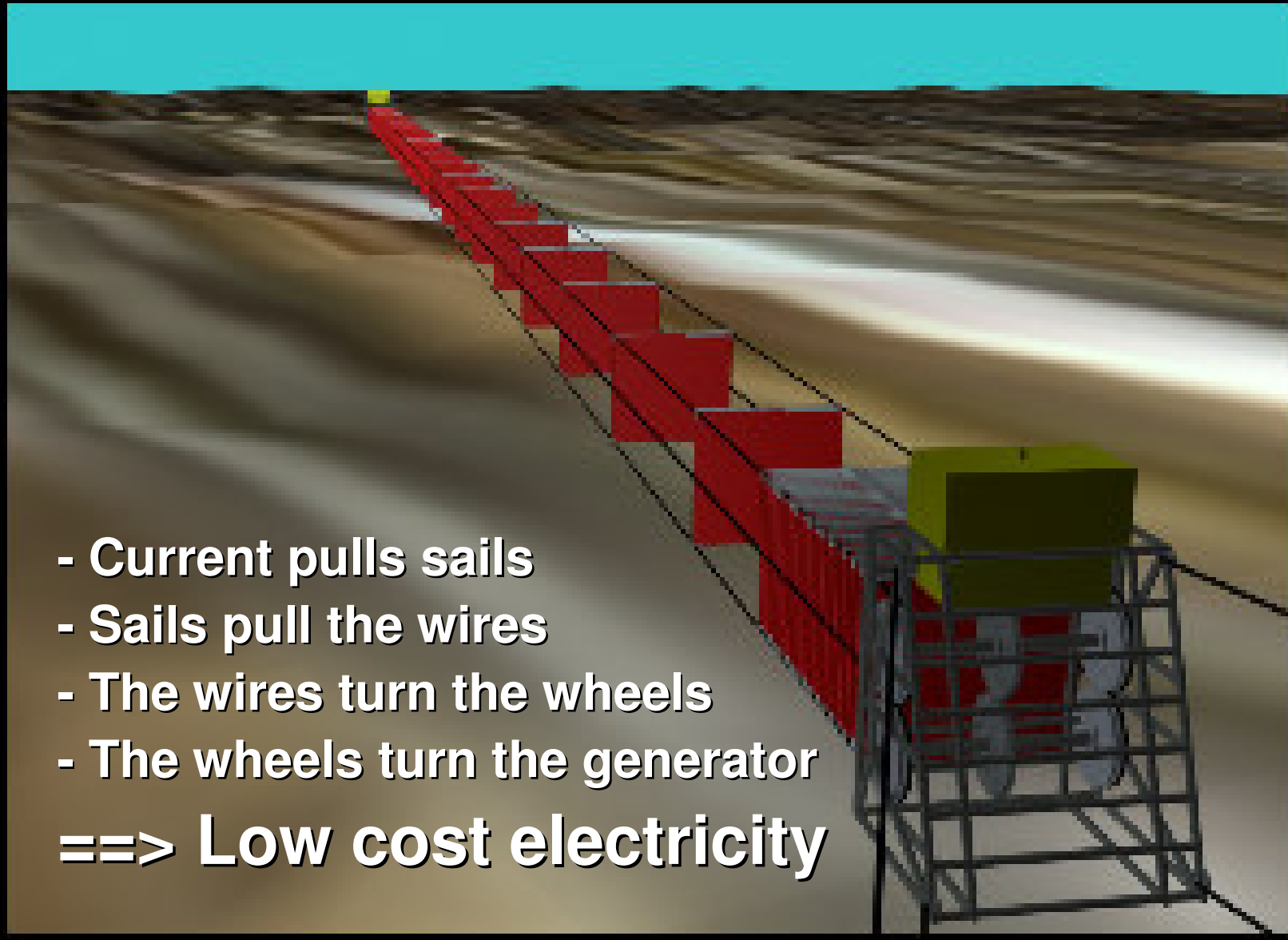


Tidal stream



How?

- Current pulls sails
 - Sails pull the wires
 - The wires turn the wheels
 - The wheels turn the generator
- ==> Low cost electricity**



Governing equations :

Force :

$$F_s = \frac{1}{2} C_{dl} A_{ps} \rho (V_c - V_s)^2$$

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$$\mathbf{P}_s = \frac{1}{2} C_{dl} A_{ps} \rho (\mathbf{V}_c - \mathbf{V}_s)^2 \mathbf{V}_s$$

Governing equations :

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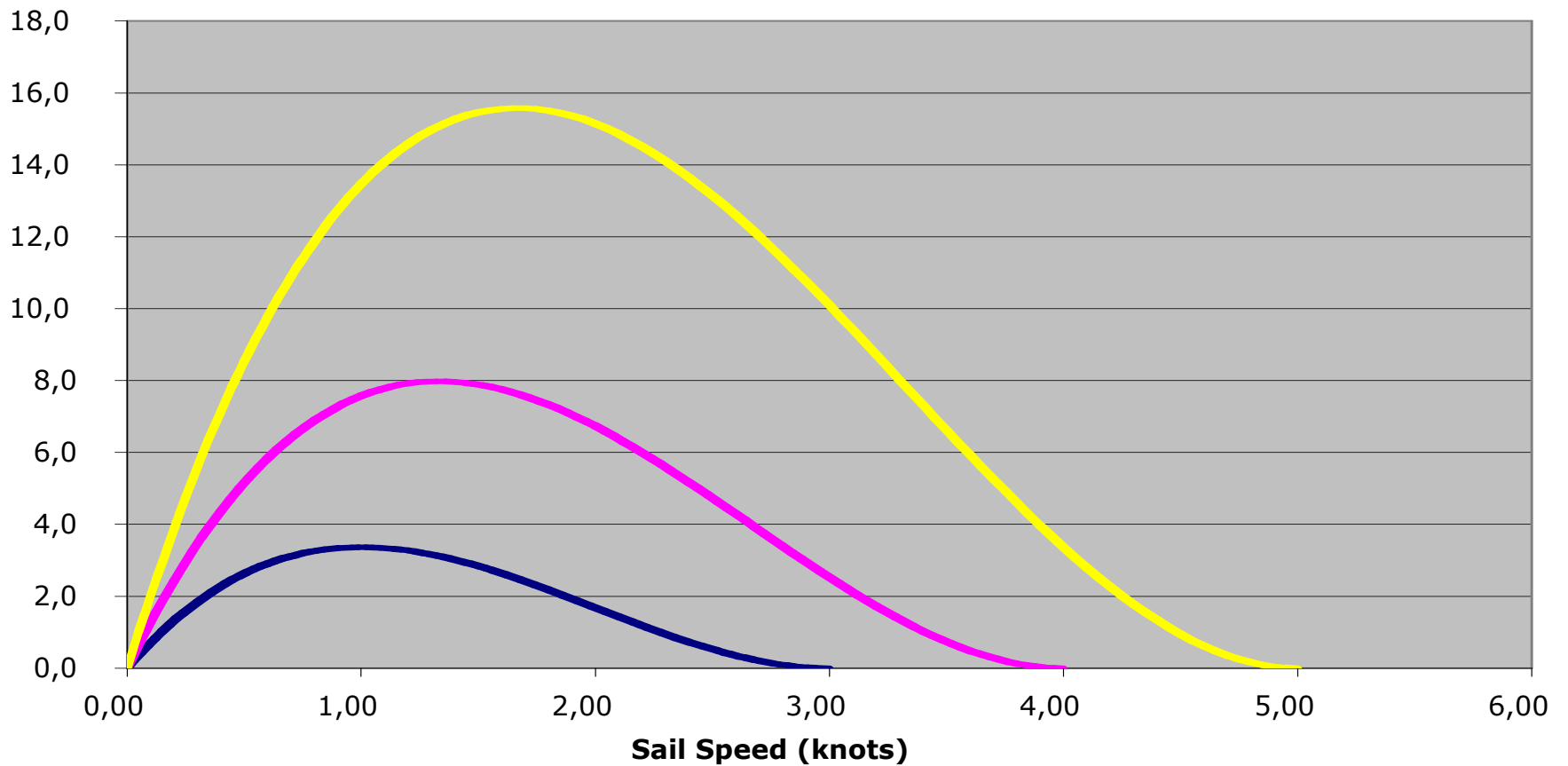
Energy :

$$P_s = \frac{1}{2} C_{dl} A_{ps} \rho (V_c - V_s)^2 V_s$$

Energy output maximized at $V_s = \frac{1}{3} V_c$

Effect Curves based on small 10 m² Sails

Effect curves



What?

- **Develop and build a 6MW, € 6 mill Prototype**
- **Competitive advantages**
 - Large **area exposed** into the tidal stream
 - High durability and minimal maintenance
 - Much higher power production than existing technologies
 - More environmentally friendly than competitors
 - Expected price per KWh 0,05€ (Prototype!) – **Low cost energy!!**
- **Major contribution from Industrial Partners!**
- **Major Governmental support!**
- **IP status :- PCT approved March 2006!**
 - Norwegian patent approved 5. Mai 2006

Radical disruptive technology!

Who?

■ Tidal Sails AS (established 2004)

- **Founder/MD:** Are Børgesen, Airline Pilot ATPL
- **Chairman:** Dr.Scient. Vidar Thorsen
- **Technical Dir:** Prof., Dr.Ing. Torgrim Log
- **Legal Dir:** Attorney, LLM Leif Thrane
- **Marketing Dir:** MSc Robin Veldt

■ Advisory group:

- Professor Arne E. Holdø (FMRG, Univ.of Hertfordshire, UK)
- Professor Jan S. Vaagen (Univ. of Bergen)
- MSc Jens C. Lindaas (HSH, Imenco Engineering)

Partners

- Technical: Wartsilla Automation, Aker Kvaerner, Hydro Aluminium, Rubb International, FMRG (Univ. of Hertfordshire), HSH
- Collaborating companies: DSM, Marlow Ropes, Scanrope, Alderney Renewable Energy, NEAS
- Major contractors for worldwide exploitation!

Market

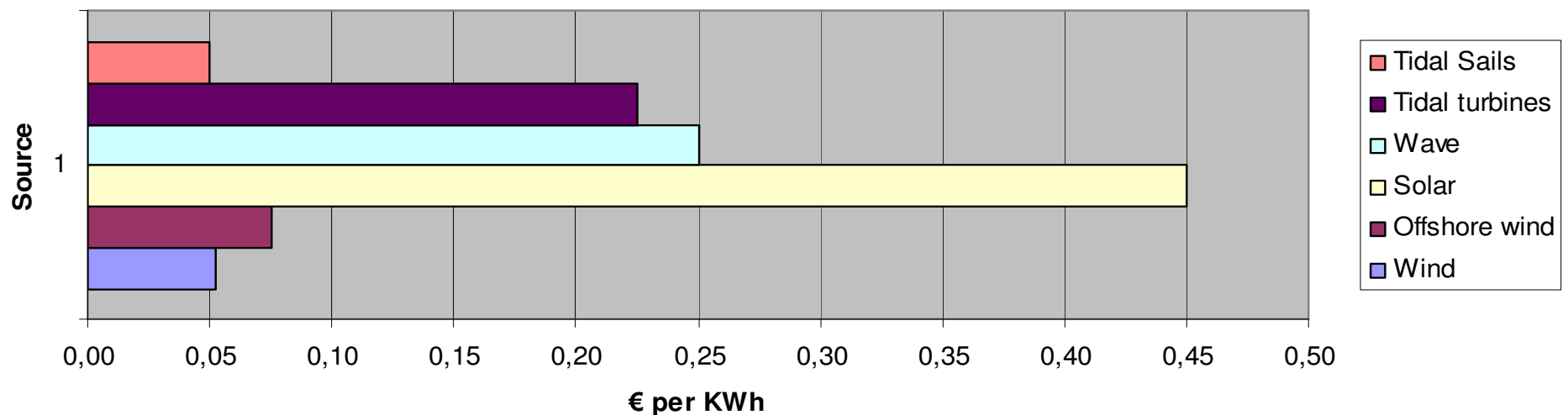
Desperate shortage of clean, -low cost energy!

Extractable energy from charted tidal currents in:

- Norway 1.5 TWh
- UK 60 TWh (20% of domestic consumption)
- EU 105 TWh
- The World 450-3000 TWh (estimate €1 trillion)

Customers: Major energy companies

Alternative energy comparison



Capital need

- To build a 6 MW, € 6 mill scale Prototype:
 - Contribution from industrial partners (20-40%)
 - Grants: IN, Enova, UK, EU (50-70%)
 - Capital need is estimated at **€ 2,5 mill**
- An investment will trigger € 3-4 mill in grants!
- Tidal Sails will be profitable from 2009
- Risk factors: Technical development

Business case

Tidal Sails will receive **10% royalty** of total:
Construction price & Electricity sale over 20 years

➤ No wages/payouts to current staff before commercialisation.

- Prototype Sale
- Partners will act as sub-suppliers - LOI
- Tidal Sails: marketing and sales company after development phase
- Power Plants will be built by Major Worldwide Contractors

Tidal Sails AS controls critical resources!

INVESTORS

**Outline of possible
operational structure**

Tidal Sails AS

- Exclusive right to utilize patent
- Shareholder agreement
- Prototype owner

INVESTORS

(local operator)

10% royalties

100% ownership

Joint Venture project

Milestones

- PCT priority Dec. 2003 (Patent pending)
- CFD and first verification, Oct. 2005
- **PCT received March 2006, Norwegian patent 5. Mai 2006**
- Tank testing, FMRG, UoH, UK, 2006
- Prototype miniature design, August 2006

Our Goals

- Grid connected Prototype in 2008
- Sale of Prototype in Norway in 2009
- UK market exploitation starting in 2009
- USA, Canada and South East Asia from 2010
- Along with worldwide construction partners:
 - By 2010 : Build first 20 commercial plants on 2 locations in UK
 - By 2011 : Mass-produce Tidal Sails for world wide exploitation

Summary

- Exclusive international patent.
- **Large area for energy collection.**
- Capability of spanning across otherwise inexploitable depths with high current speeds.
- **Low maintenance, low cost - clean energy!**
- Out of sight-out of sound!
- No wages or other payouts to Tidal Sails staff.
- Your investment will trigger grants.
- Large international potential.
- A market desperate for clean energy.

Thank You!

Please do not hesitate to come and see us afterwards, -if you are interested in learning more!

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