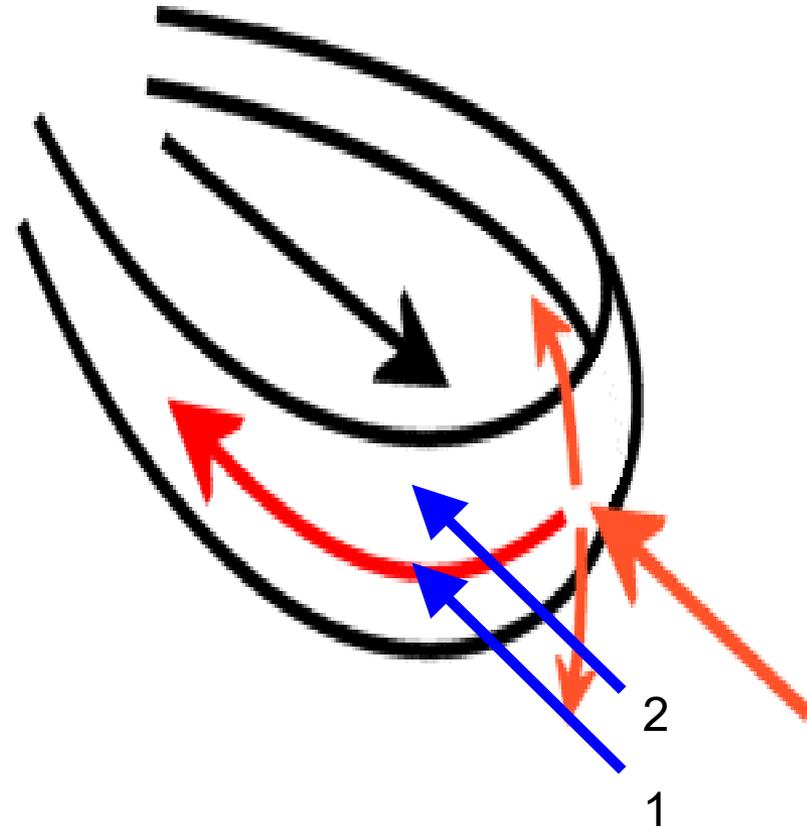


Flow deflections ahead of fast ICMEs

- ICMEs moving faster than solar wind
 - Solar wind flows toward leading edge (blue arrows)
 - Cannot penetrate flux-rope leading edge (black)
 - Solar wind is deflected round ICME in sheath (red arrows)
- Assume **concave outward** leading edge (this will be tested)
- Pass through centre (trajectory 1)
 - Observed flow deflected parallel to axis
- Intersect off-axis (trajectory 2)
 - Observed flow deflected away from axis
 - Angle between flow and axis increases with increasing distance from axis
 - Direction of deflected flow is determined by whether the spacecraft intercepts above or below axis



Flows in sheath are consistent with flux-rope models

- **5 events** (black points) looked at previously (Owens and Cargill, 2004, in press)
 - Events selected on the basis of ordered sheath flows and good magnetic cloud signatures
 - In **all cases sheath flows were consistent** with above/below crossing inferred by VA
 - B_{MIN} (i.e. further from axis according to VA) increases with θ_N (i.e. further from axis according to deflected sheath flow).
- **May 15th 1997 ICME** (red points) fits with this trend
- Deflected flows allow estimate of cross-sectional elongation of ICMEs
 - Preliminary analysis suggests **ICMEs at 1-AU are highly “flattened”**

