

FIGURE 37. A space in which the causality and past distinguishing conditions hold everywhere, but the future distinguishing condition does not hold at  $p$  or  $q$  (in fact,  $I^+(p) = I^+(q)$ ). The light cones on the cylinder tip over until one null direction is horizontal, and then tip back up; a strip has been removed, thus breaking the closed null geodesic that would otherwise occur.

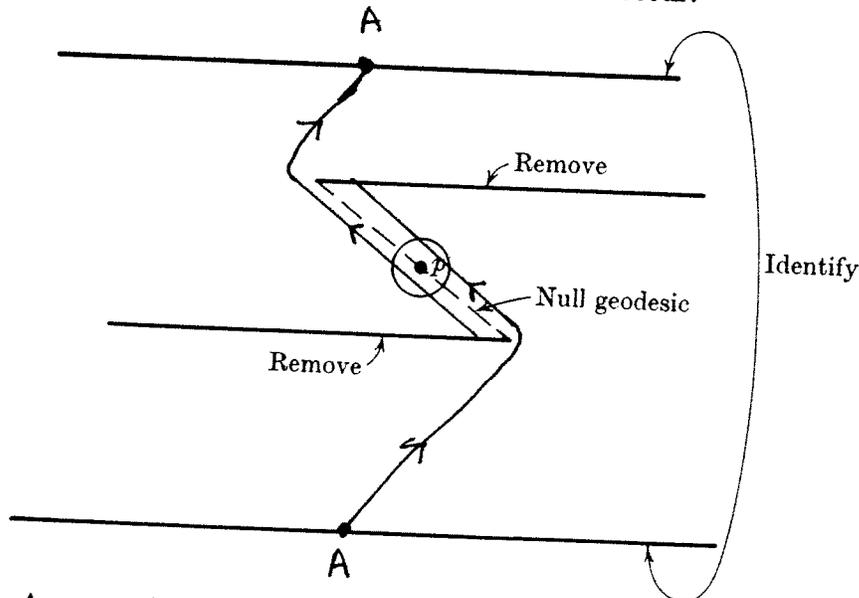


FIGURE 38. A space-time satisfying the causality, future and past distinguishing conditions, but not satisfying the strong causality condition at  $p$ . Two strips have been removed from a cylinder; light cones are at  $\pm 45^\circ$ .