Pf: Suppose T_n conv.

Fix any $\varepsilon > 0$

$\exists N : |T_{n+k} - T_n| < \varepsilon$

for all $n \geq N$ and $k > 0$

For such $n \geq N$ and $k > 0$

$$|S_{n+k} - S_n| = \left| \sum_{n < j \leq n+k} a_j \right|$$

$$\leq \sum_{n < j \leq n+k} |a_j|$$

$$= \bar{S}_{n+k} - \bar{S}_n$$

$$\leq \sum_{n < j \leq n+k} b_j = T_{n+k} - T_n$$

$$< \varepsilon$$

Hence S_n and $\bar{S}_n$ are Cauchy seqs.