

FORTLS: un paquete de R para el procesado de datos del Escáner Laser Terrestre (TLS) y estimación de variables dasométricas en inventarios forestales (IFs)

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González, Fernando Montes, César Pérez-Cruzado



Financiación



Unión Europea

Fondo Europeo
de Desarrollo Regional

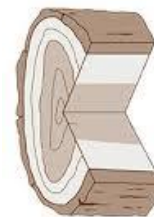
"Promover el desarrollo tecnológico, la innovación y una investigación de calidad."



Ayudas para la formación de profesorado universitario (FPU 16/03057)
(Juan Alberto Molina-Valero)

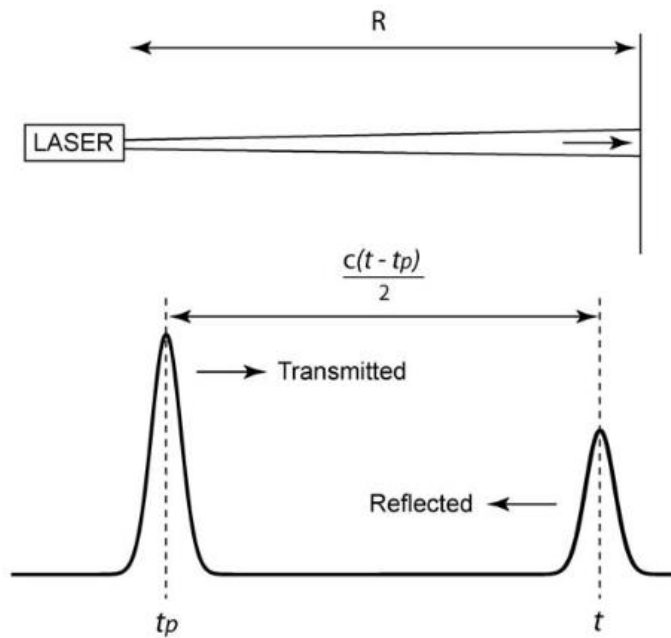
Ayudas para contratos Ramón y Cajal (César Pérez-Cruzado)

"Modelización del efecto de la intensidad de perturbación sobre la estructura y el stock de carbono en masas naturales a partir del Inventario Forestal Nacional" (AGL2016-76262-R)

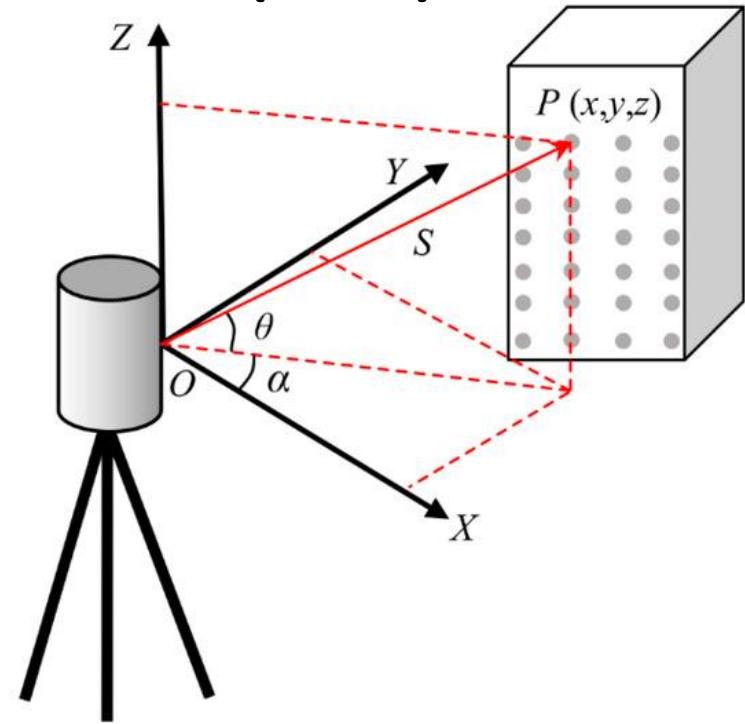


CERNA

El Escáner Láser Terrestre o Terrestrial Laser Scanner (TLS)

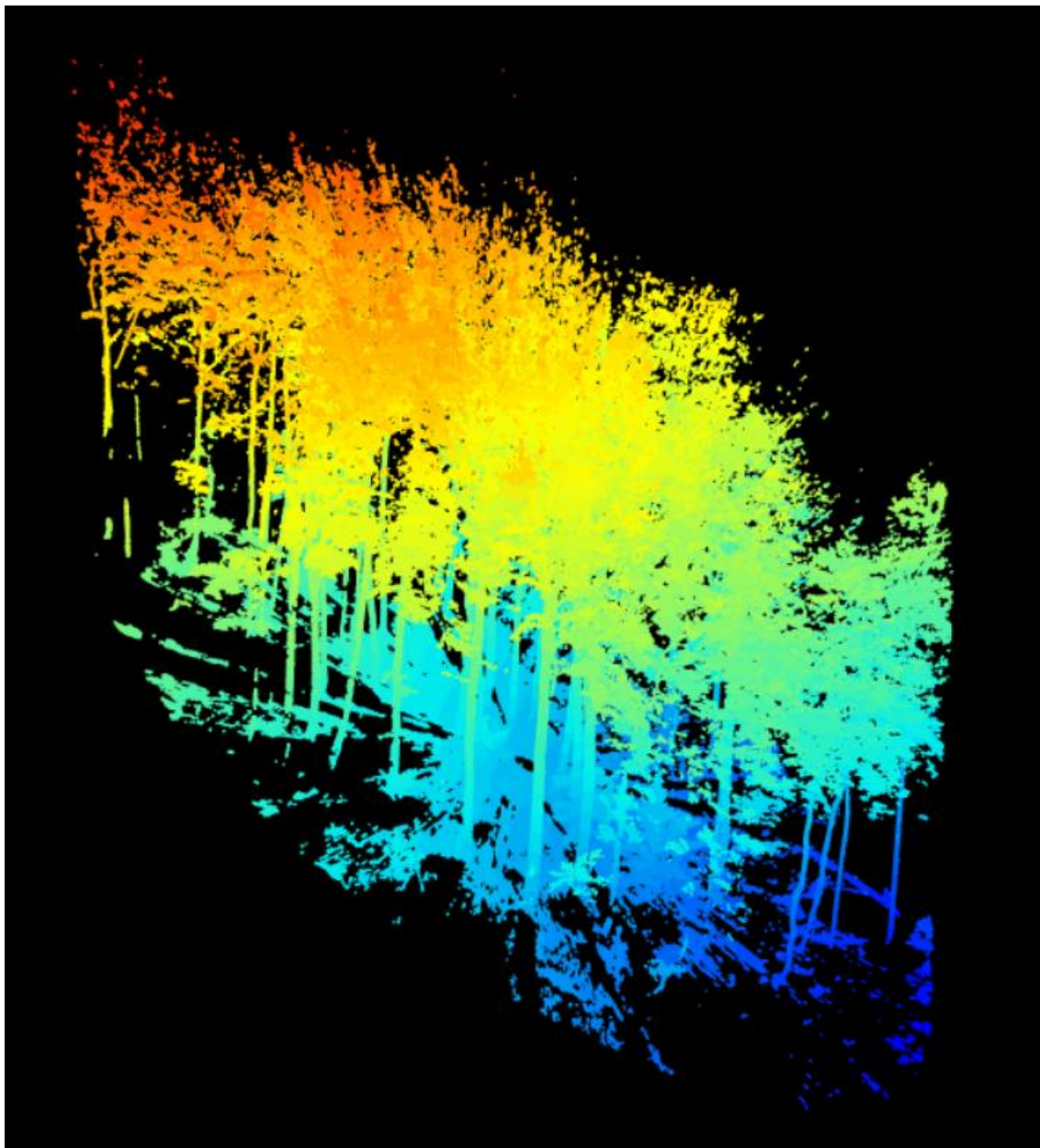


(Jupp et al., 2011)



(Xu et al., 2019)

Light Detection and Ranging (LiDAR)



Parámetros del TLS:

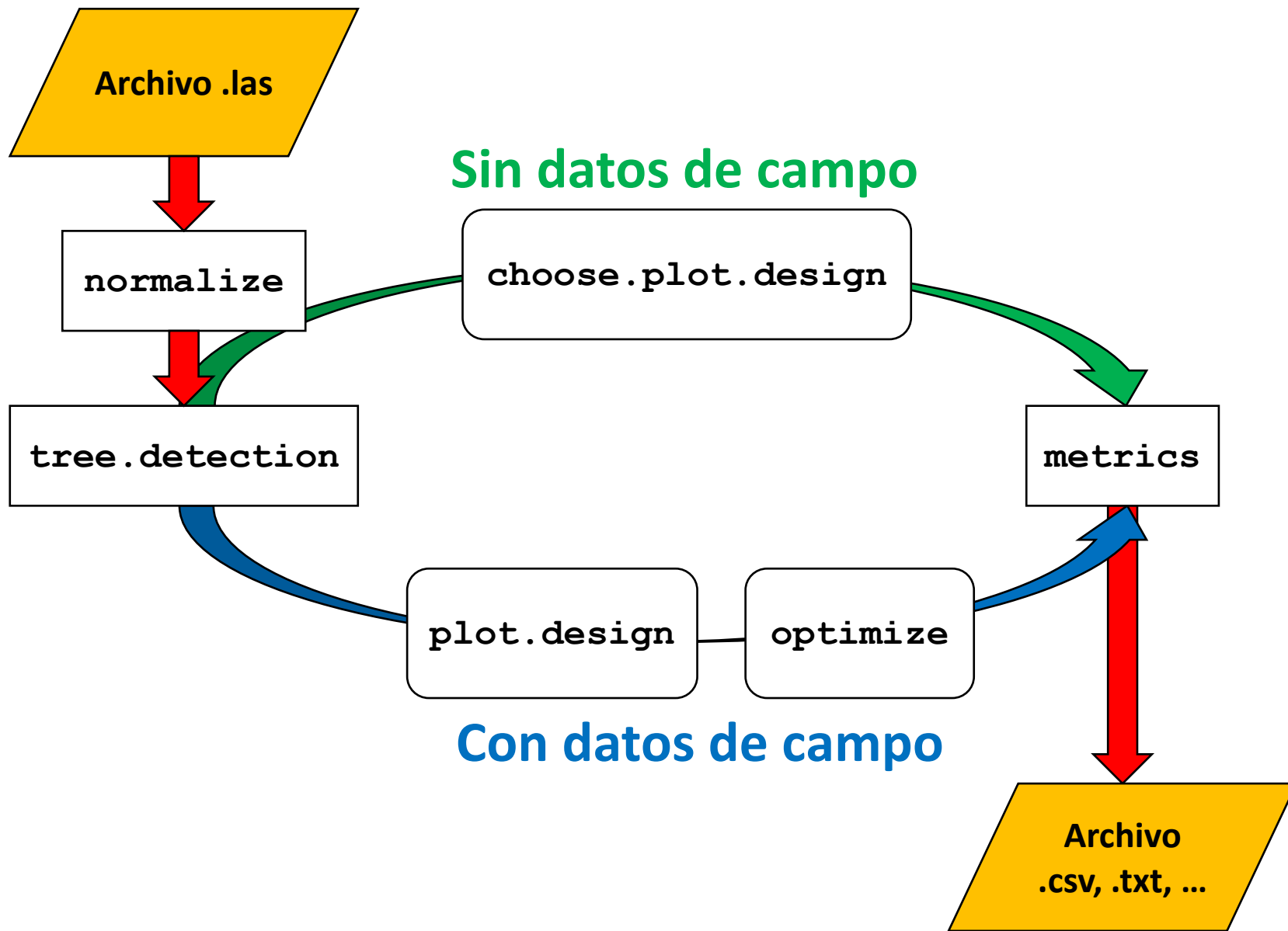
- Campo 360° / 300°
- Precisión: 7.67 mm / 10 m

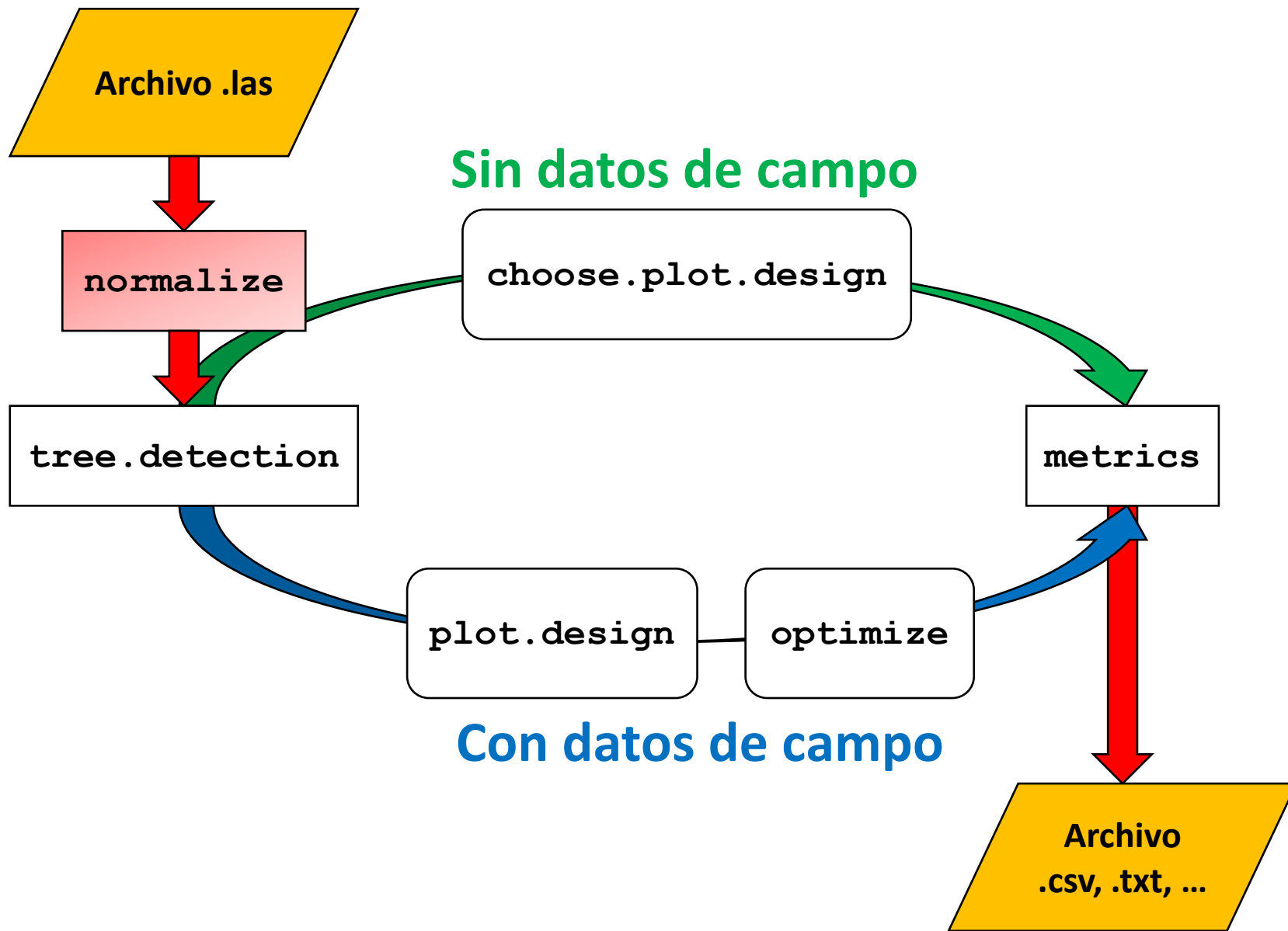
Parcela de 25 m de radio en hayedo:

- 26.86 millones de puntos
- 13755.54 puntos/m²
- 614.7 Mb

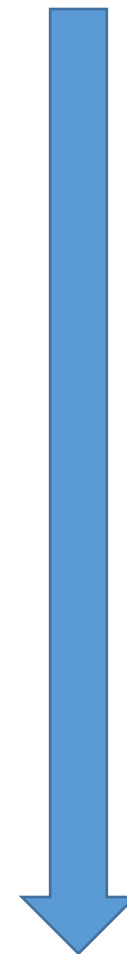
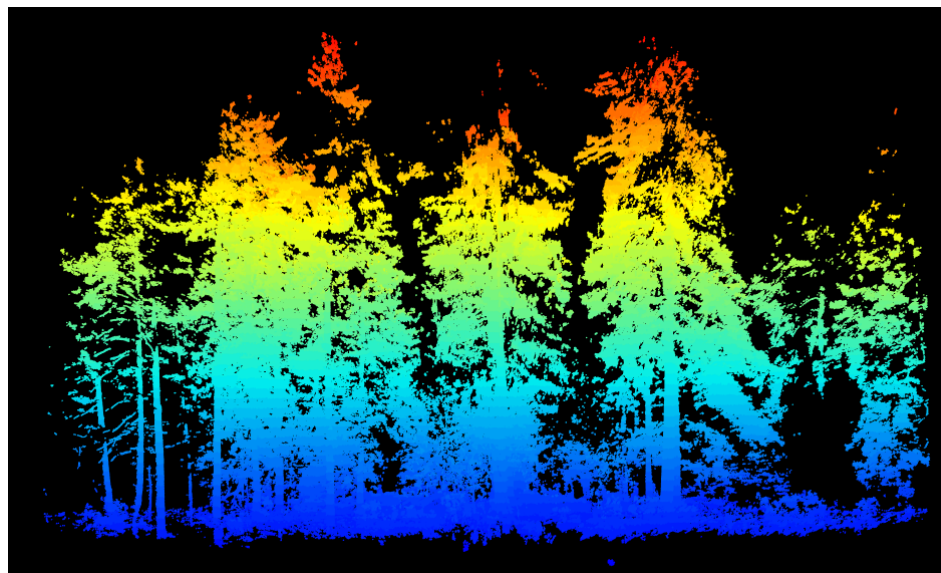
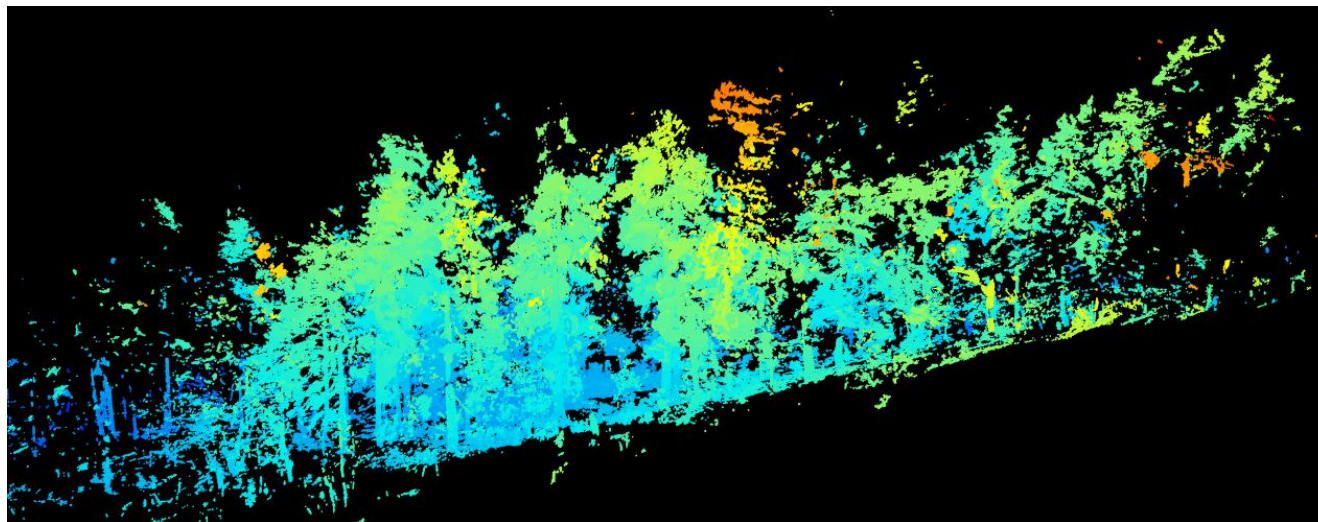


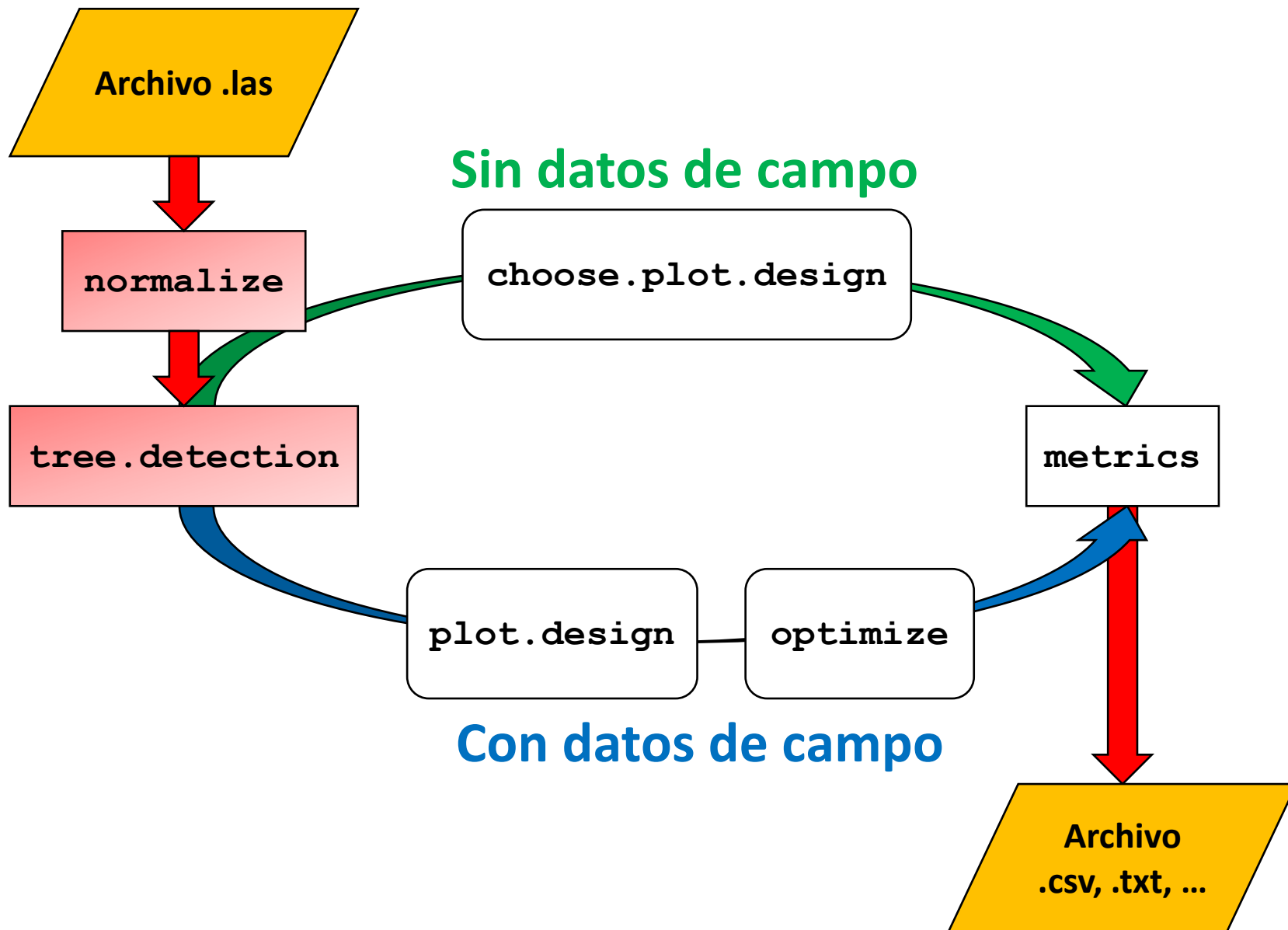
En este trabajo se presenta el paquete `FORTLS` de \mathbb{R} , que tiene como principal funcionalidad la automatización del procesamiento de los datos TLS para su uso en inventarios forestales.



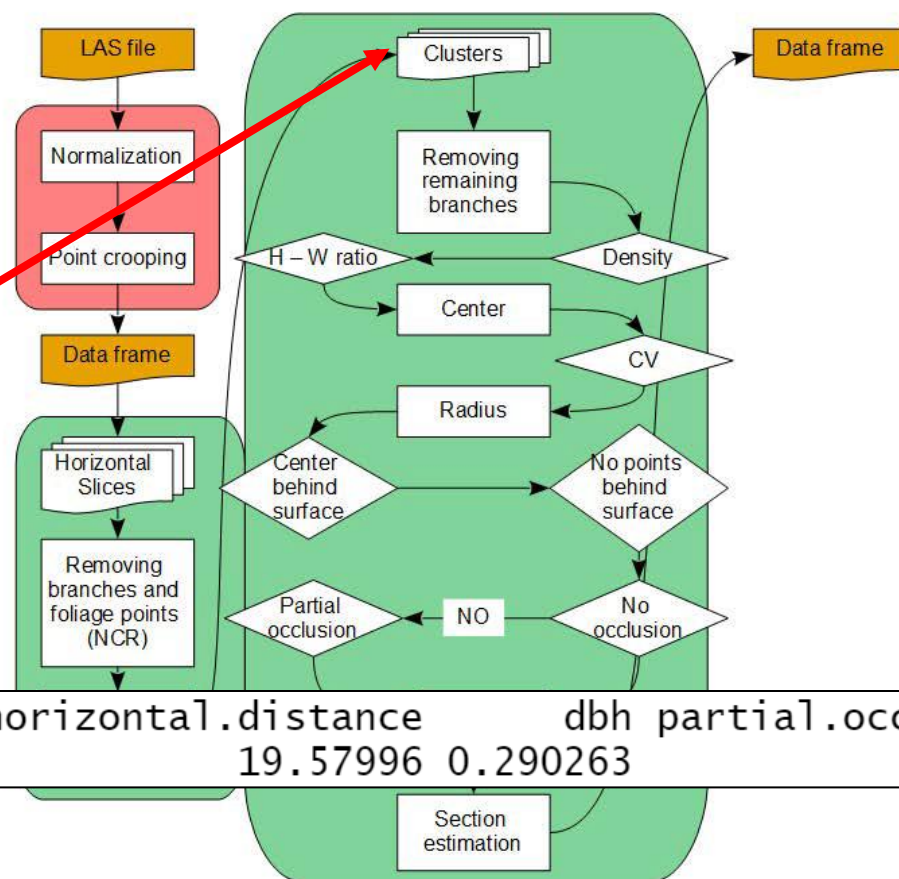
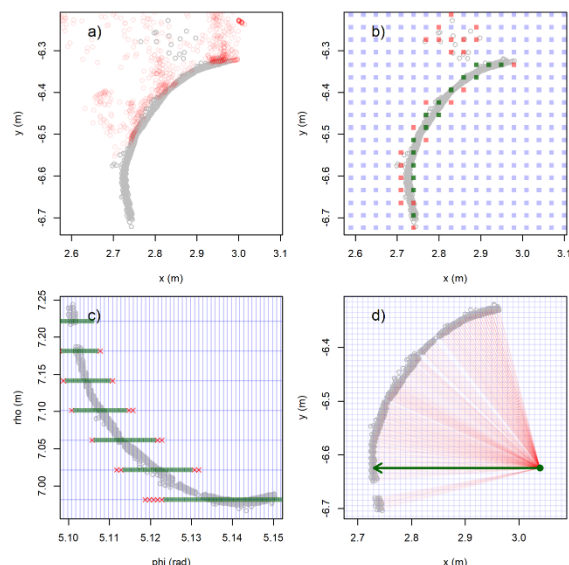



```
normalize(las, max.dist, min.height, max.height)
```

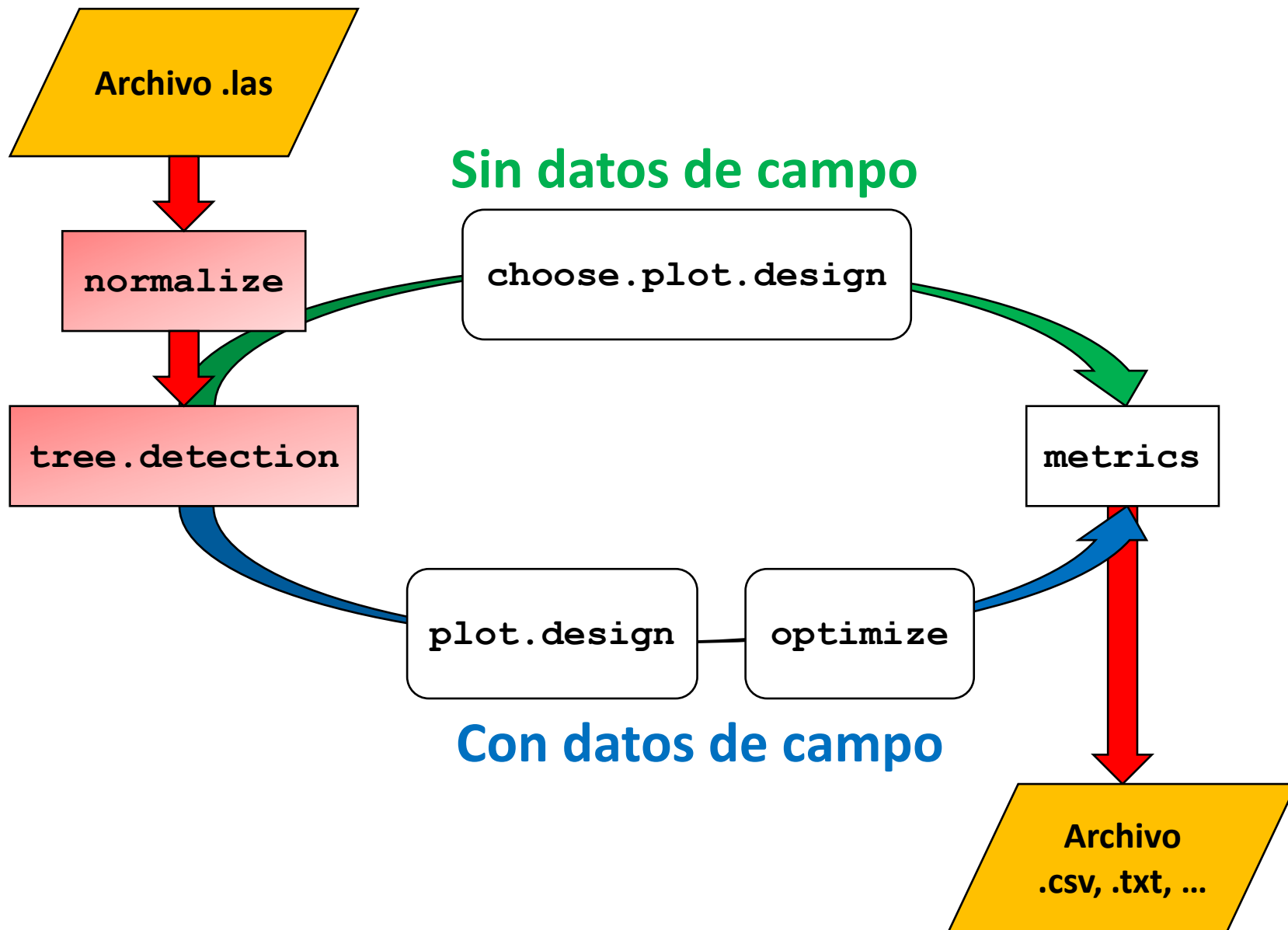




```
tree.detection(data, dbh.min, dbh.max,
tls.resolution = list(point.dist = 7.67, tls.dist = 10),
breaks = c(1.0, 1.3, 1.6), plot.attributes)
```



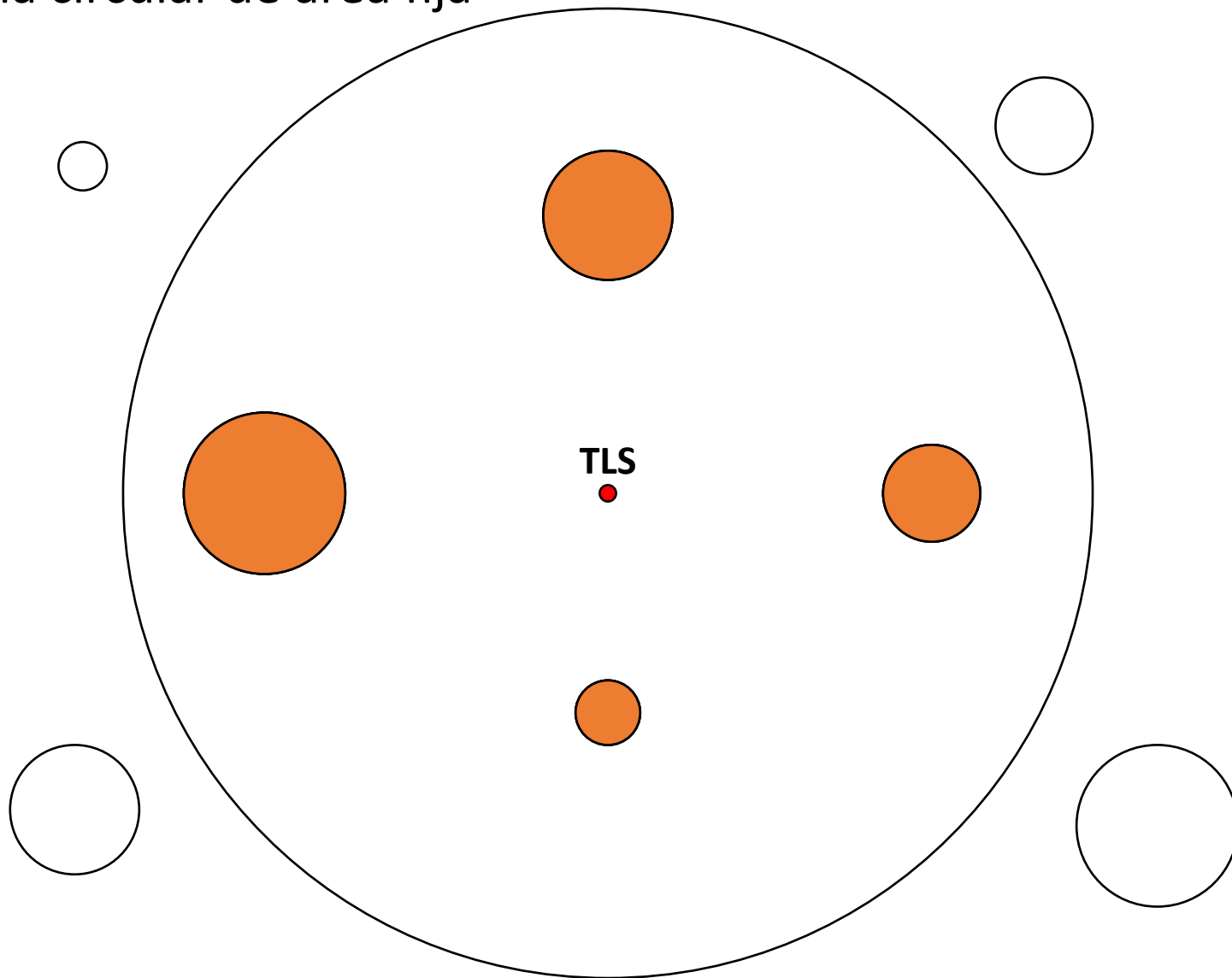
id	file	tree	x	y	horizontal.distance	dbh	partial.occlusion
0	000.txt	1	-19.1748	-3.962532	19.57996	0.290263	0



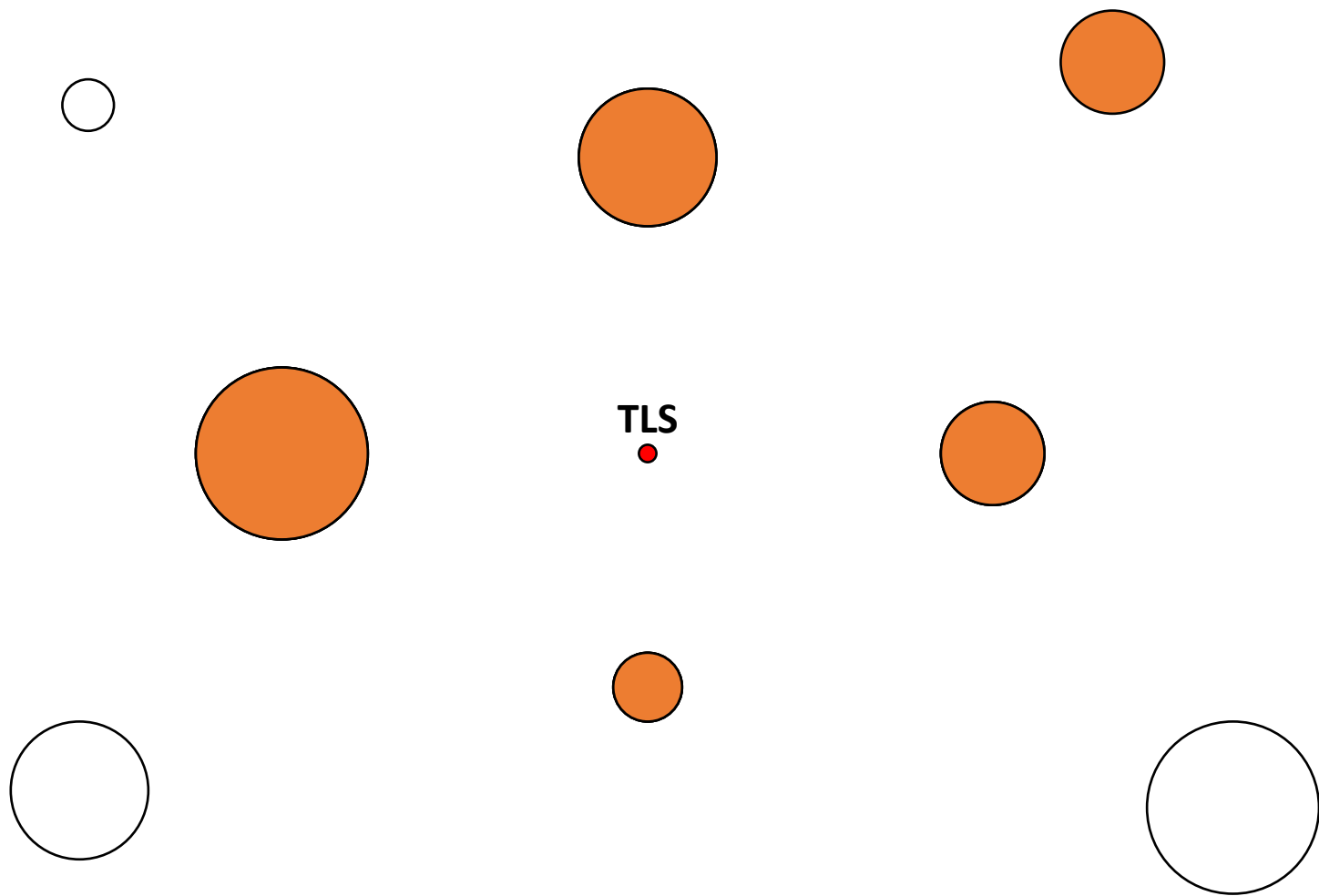
Variables de interés en inventarios forestales

Variable	Unidades
Densidad (N)	Árboles ha ⁻¹
Área basimétrica (G)	m ² ha ⁻¹
Volumen (V)	m ³ ha ⁻¹
Diámetro medio (dbh)	cm
Diámetro dominante (Ddom)	cm
Altura media (hm)	m
Altura dominante (Hdom)	m

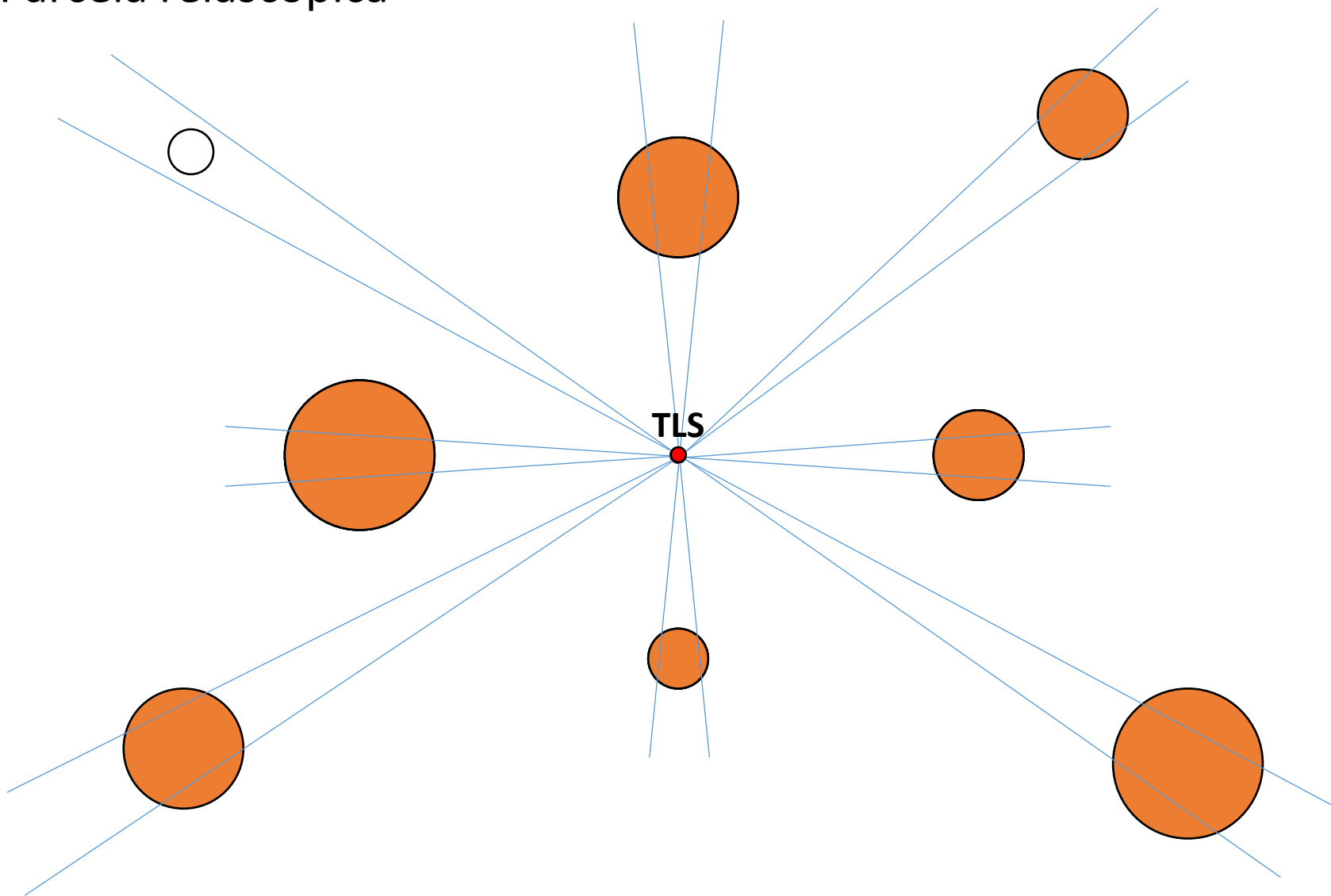
Parcela circular de área fija



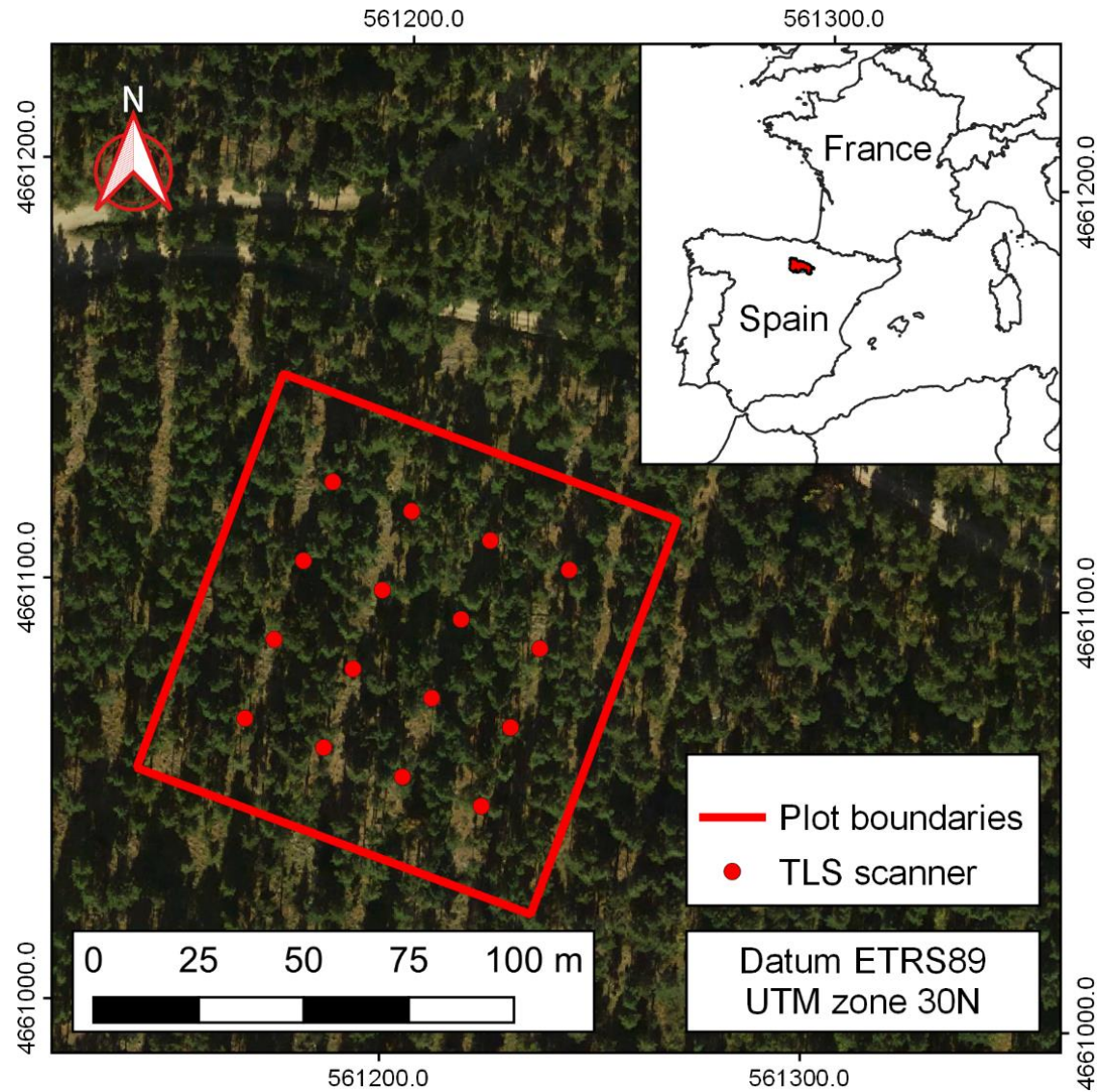
Parcela k-tree (k = 5)

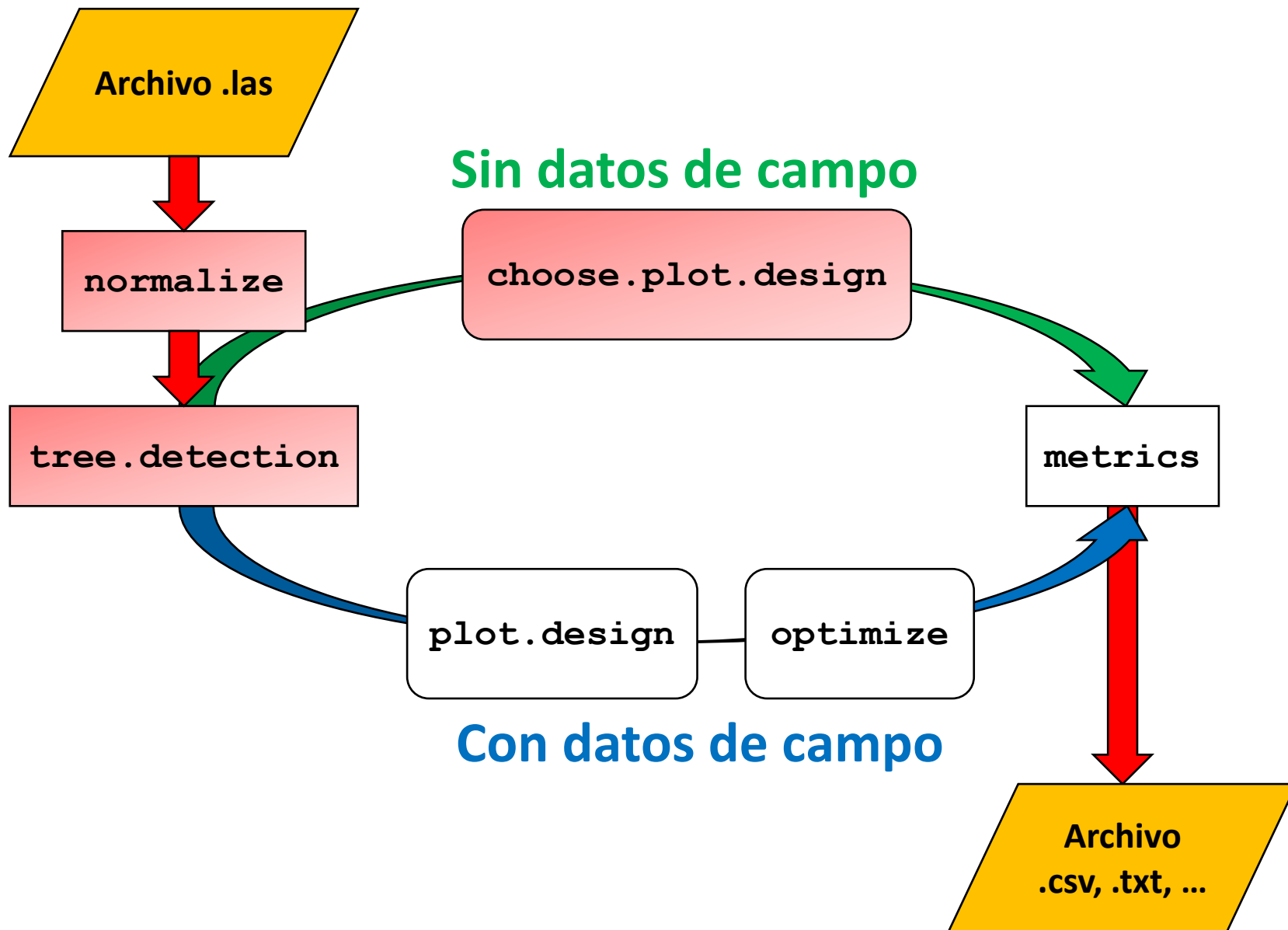


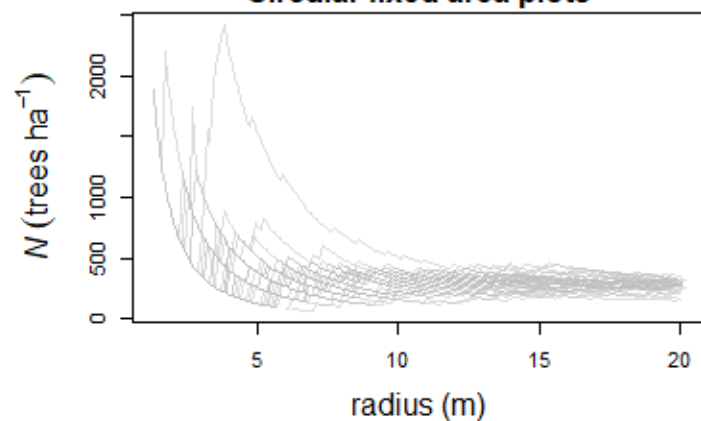
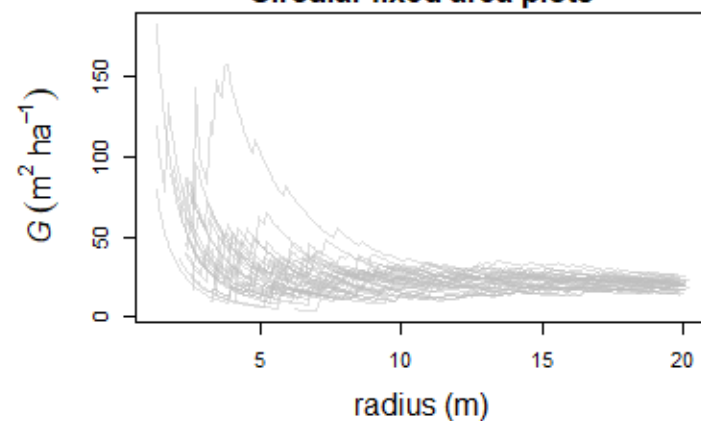
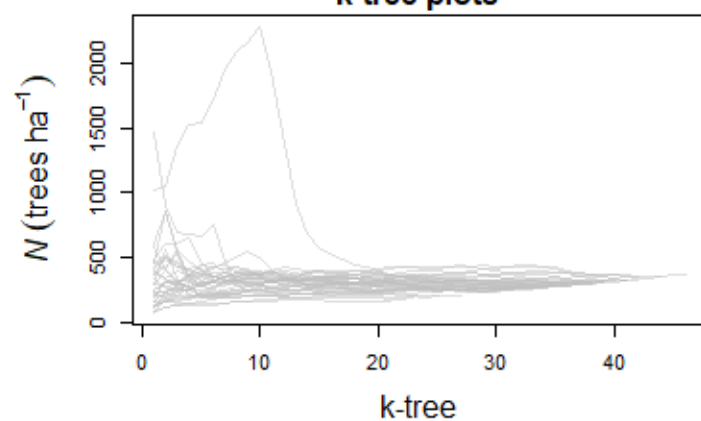
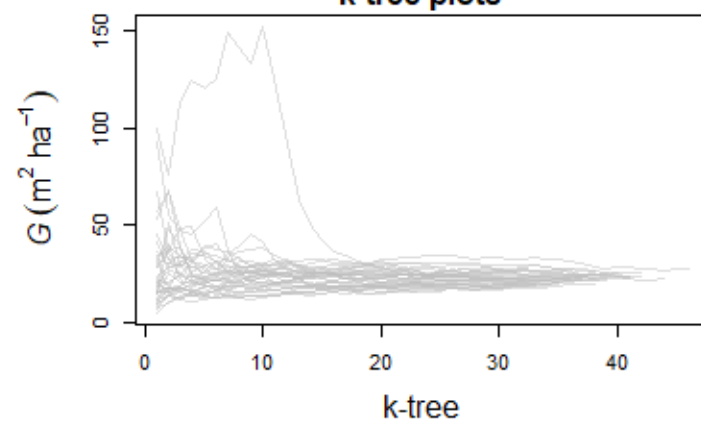
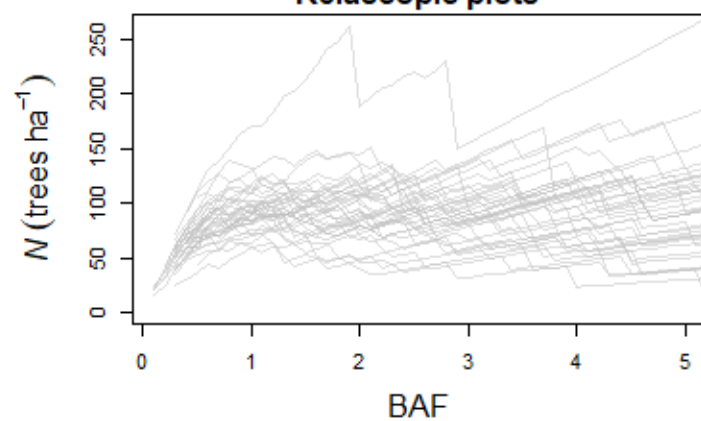
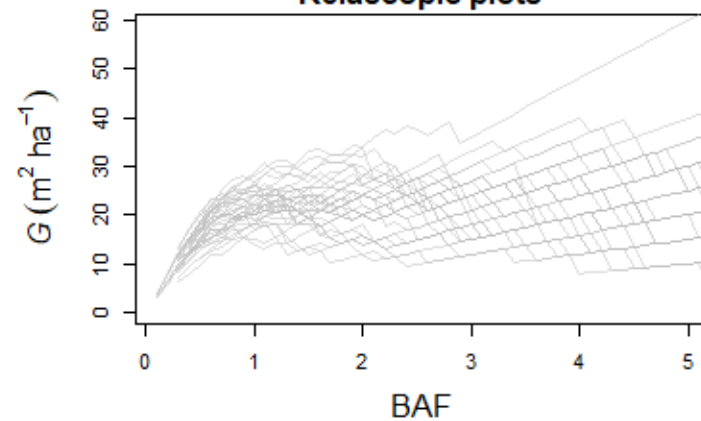
Parcela relascópica



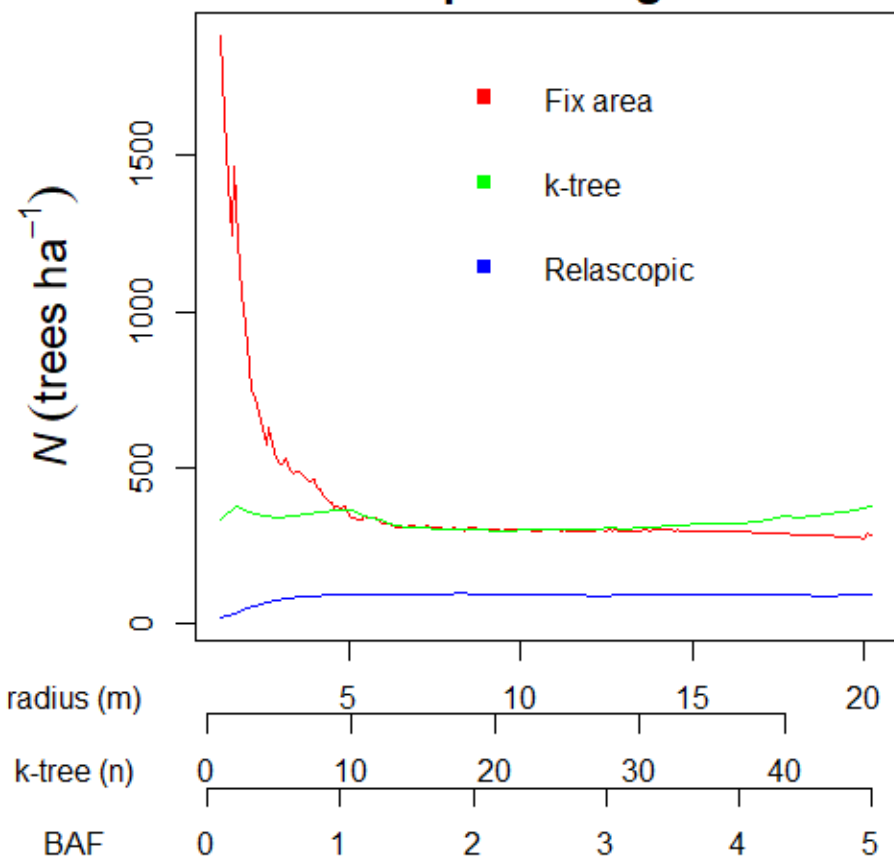
Caso de estudio



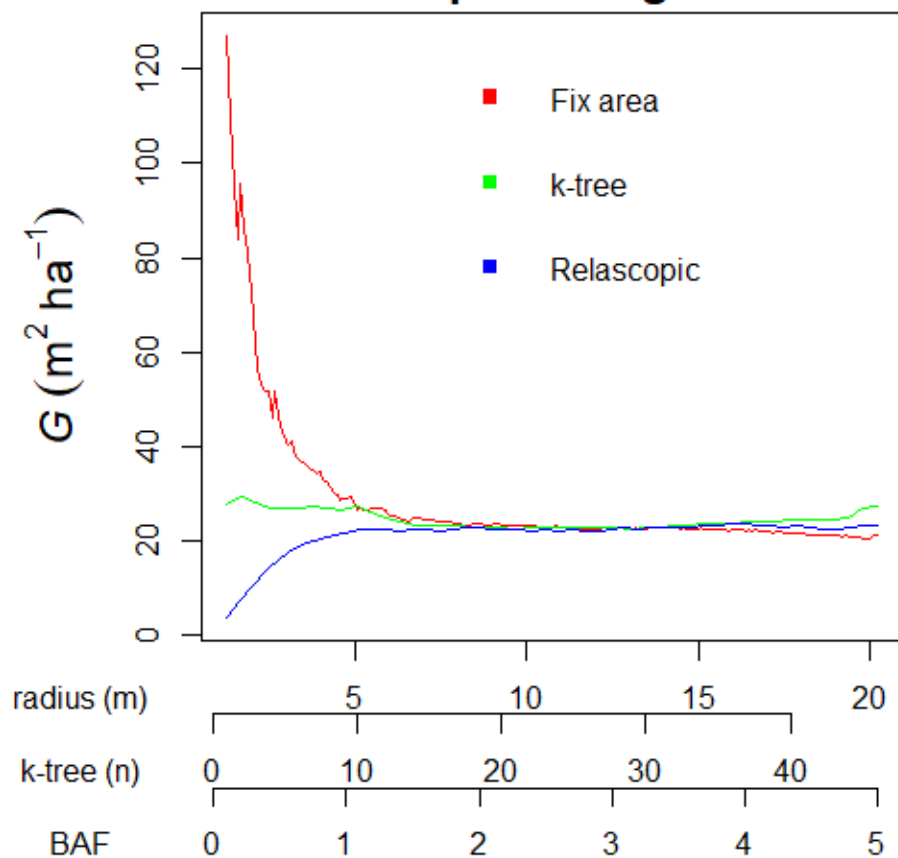


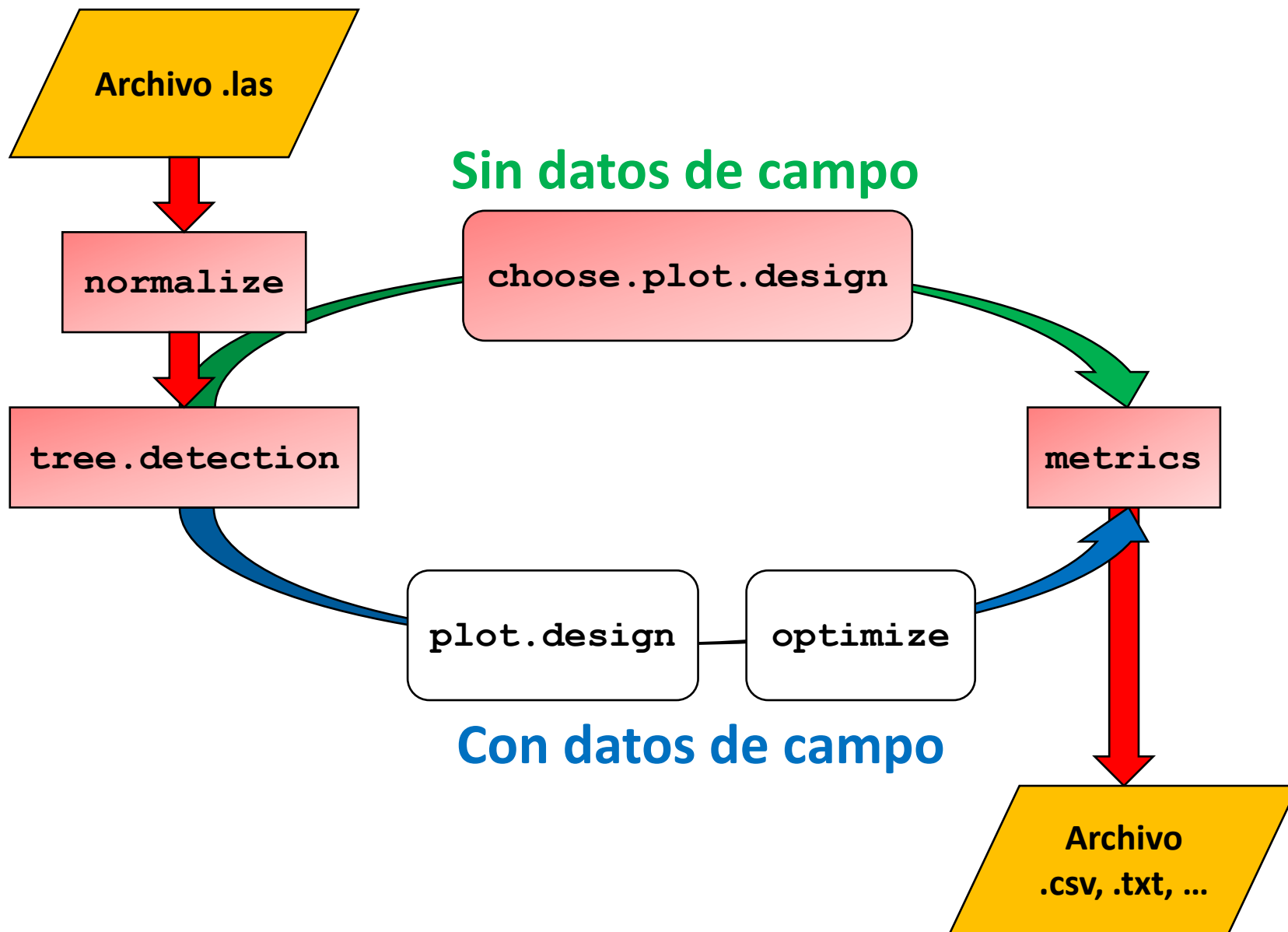
Circular fixed area plots**Circular fixed area plots****k-tree plots****k-tree plots****Relascope plots****Relascope plots**

All plot designs



All plot designs

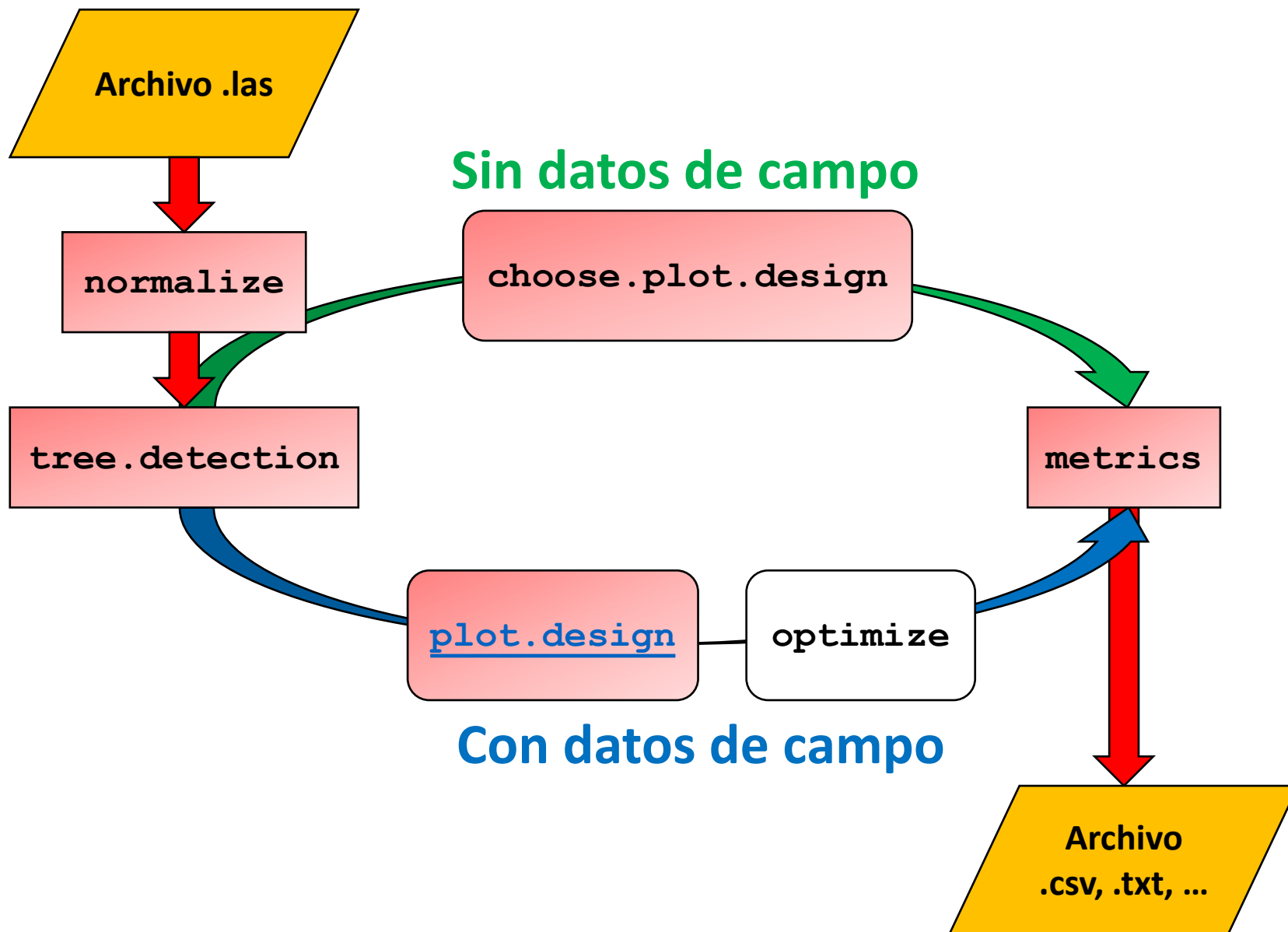


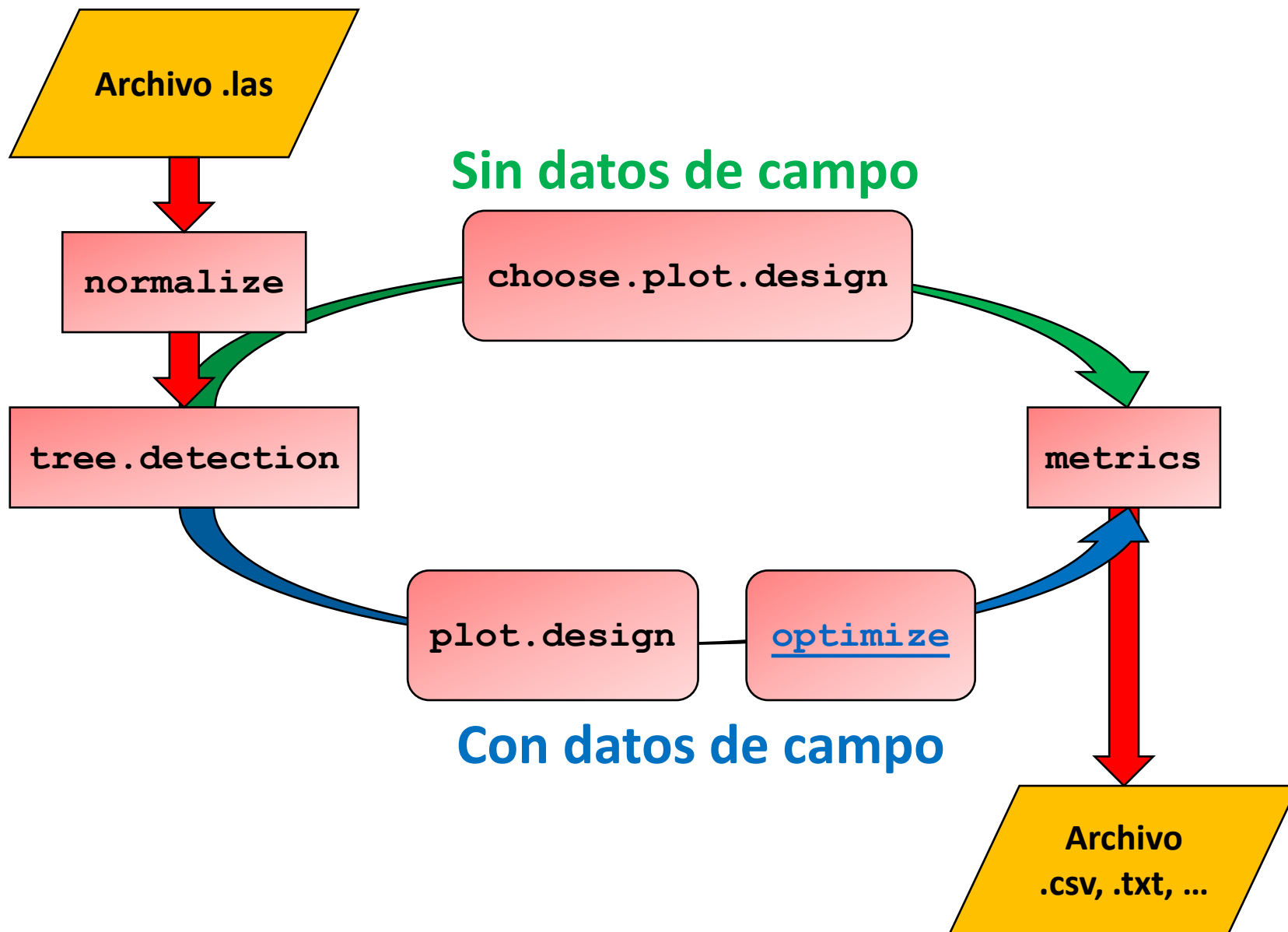


```
metrics(data, tree.list, point.transects (opcional),
plot.parameters = list(plot.radius, k.tree, baf,
num) )
```

metrics.TLS	list [3]	List of length 3
fix.plot	list [1 x 61] (S3: data.frame)	A data.frame with 1 row and 61 columns
k.tree	list [1 x 61] (S3: data.frame)	A data.frame with 1 row and 61 columns
relascope.plot	list [1 x 32] (S3: data.frame)	A data.frame with 1 row and 32 columns

num.ptos, num.ptos.hom, num.ptos.est, num.ptos.hom.est,
N, N.hn, N.hr, N.nh.cov, N.hr.cov, N.sh, N.corr,
G, G.hn, G.hr, G.nh.cov, G.hr.cov, G.sh, G.corr,
V, V.hn, V.hr, V.nh.cov, V.hr.cov, V.sh, V.corr,
dbh.arit, dbh.sqrt, dbh.geom, dbh.harm,
Ddom.arit, Ddom.sqrt, Ddom.geom, Ddom.harm,
hmP99.arit, hmP99.sqrt, hmP99.geom, hmP99.harm,
HdomP99.arit, HdomP99.sqrt, HdomP99.geom, HdomP99.harm,
HdomP99.arit.est, HdomP99.sqrt.est, HdomP99.geom.est, HdomP99.harm.est,
P01, P05, ..., P95, P99, Pmean, Pcv







¡Muchas gracias por
su atención!