DAFTAR PUSTAKA

Atmadipoera, Agus S, dkk. 2016. *Variasi Spasial dan Temporal Arlindo di Selat Makassar*. Institut Pertanian Bogor. Bogor.

Atmadipoera, Agus S, dan Galang L. Mubaraq. 2017. *Struktur dan Variabilitas Arlindo di Laut Sulawesi.* Institut Pertanian Bogor. Bogor.

Basri, Muhammad Rizal. 2017. *Analisis Pola Sebaran Massa Air Perairan Halmahera, Papua Barat dan Sekitarnya*. Universitas Hasanuddin. Makassar.

Bishop, J. M. 1984. *Applied Oceanography*. John Wiley and Sons Inc. New York.

Cahyaningrum, Agus Diah J. D. 2009. *Karakteristik Massa Air Arlindo Di Pintasan Timor Pada Musim Barat Dan Musim Timur*. Institut Pertanian Bogor. Bogor

Gordon, Arnold L. 1986. *Interocean exchange of thermolic water. Journal Geophysical Research 91* : 5037-5046.

Gordon, Arnold L. 2005. *Oceanography of the Indonesian Seas and their throughflow*. Oceanography Vol. 18, No. 4.

Hannachi, A. 2004. *A Primer for EOF Analysis of Climate Data*. Departemen Of Meteorology.

Hannachi, A. 2007. *Empirical Orthogonal Functions and Related Techniques in Atmospheric Science: A Review*. Departemen Of Meteorology.

Hasanuddin, M. 1998. *Arus Lintas Indonesia*. Pusat Penelitian dan Pengembangan Oseanografi – LIPI. Jakarta.

Horhoruw, Selfrida Missmar. 2016. *Struktur dan Variabilitas Arus Lintas Indonesia di Selat Makassar.* Institut Pertanian Bogor. Bogor.

Ilahude, A.G. dan Gordon, Arnold L. 1994. *Water Masses of the Indonesian Seas Through flow*. Proceeding IOC-WESTPAC Third International Scien-tific Symposium on Bali, Indonesia.

Ilahude, A. G., dan A. L. Gordon. 1996. *Thermocline stratification within the*

Indonesian seas. J.Geophys. Res. 101:12,401-12,409.

Ilahude, A. G. 1999. *Pengantar ke Oseanografi Fisika*. P30 LIPI. Jakarta.

King, C. A. M. 1963. *An Introduction to Oceanography*. McGraw Hill Book Company Inc. New York.

Pickard, G. L., dan D. Phil. 1970. *Descriptive Physical Oceanography*. Pergamon Press. Oxford. New York. Toronto. Sydney.

Pond, S. Dan G. L. Pickard. 1983. *Introduction Dynamical Oceanography*. Pergamon Press. New York.

Pranowo, Widodo S. 2012. *Dinamika Upwelling dan Downwelling di Laut Arafura dan Timor Volume 15, Nomor 2.* Pusat Penelitian dan Pengembangan SUmber Daya Laut dan Pesisir. Jakarta.

Robial, Siti Muawanah. 2016. *Analisis Empirical Orthogonal Function (EOF) berbasis Eigen Value Problem (EVP) pada Dataset Suhu Permukaan Laut Indonesia*. Institut Pertanian Bogor. Bogor.

Rosmorduc, V. 2015. Product User Manual. Infrastructure Development of Space Oceanography (INDESO) Project.

Ross, A. D. 1970. *Introduction to Oceanography*. Meredith Corporation. New York.

Safitri, M., S.Y. Cahyarini., M.R. Putri. 2012. *Variasi Arlindo dan Parameter Oseanografi di Laut Timor Sebagai Indikasi Kejadian ENSO.* Institut Teknologi Bandung. Bandung.

Safitri, Sani. 2015. *El Nino, La Nina dan Dampaknya Terhadap Kehidupan di Indonesia*. Jurnal Criksetra, Volume 4, Nomor 8, Agustus 2015.

Sverdrup, H. V., M. W. Johnson, dan R. H. Fleming. 1942. *The Ocean Their Physic, Chemistry and General Biology*. Practice Hall Inc. Englewood.

Tomczak, M. and J. S. Godfrey. 1994. *Regional Oceanography: An Introduction*. Pergamon.

Weyl, P.K. 1970. *Oceanography: An Introduction to Marine Environment*. John Willey & Son. Inc.

Wyrtki, K. 1961. *Physical Oceanography of the Southeast Asian Waters*. Naga Report 2. Scripps Inst. Of Oceanography.

Wyrtki, K. 1987. *111du11esia11 through and the associated pressure gradient, Journal of Geophysical Research 92* : 12941-12946.

LAMPIRAN

Lampiran 1 Indeks Nino 3.4

TAHUN	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2008	-1.63	-1.5	-1.23	-0.92	-0.72	-0.49	-0.28	-0.19	-0.23	-0.32	-0.5	-0.7
2009	-0.83	-0.77	-0.56	-0.24	0.13	0.41	0.54	0.62	0.73	1.04	1.41	1.61
2010	1.52	1.24	0.9	0.45	-0.05	-0.53	-0.96	-1.31	-1.54	-1.61	-1.59	-1.56
2011	-1.41	-1.18	-0.88	-0.65	-0.43	-0.32	-0.39	-0.58	-0.81	-0.98	-1.05	-1
2012	-0.85	-0.7	-0.54	-0.38	-0.14	0.11	0.34	0.41	0.39	0.3	0.11	-0.18
2013	-0.42	-0.42	-0.28	-0.21	-0.23	-0.28	-0.31	-0.27	-0.24	-0.14	-0.12	-0.23
2014	-0.41	-0.45	-0.21	0.13	0.33	0.29	0.14	0.11	0.25	0.53	0.69	0.69
2015	0.56	0.48	0.58	0.79	1.05	1.31	1.61	1.91	2.19	2.47	2.63	2.69
2016	2.51	2.16	1.65	1.03	0.51	0.05	-0.27	-0.5	-0.61	-0.65	-0.61	-0.53
2017	-0.32	-0.14	0.11	0.3	0.43	0.44	0.23	-0.07	-0.36	-0.62	-0.79	-0.94
2018	-0.9	-0.84	-0.64	-0.41	-0.1	0.11	0.18	0.27	0.5	0.79	0.95	0.85

El Nino La Nina Netral

Lampiran 2 Script Matlab Pengolahan Data Suhu Secara Spasial dan Temporal

```
load sst2.mat
%% Matriks Data Suhu
nz = 1;
Temp = zeros(nx,ny,nt);
Temp = reshape(sst(:,:,1,:), size(Temp));
Temp = permute(Temp,[2 1 3]);

%% Plot Data Suhu Rata-Rata Bulanan
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);

figure
pcolor(x,y,mean(Temp,3))
shading interp
hold on
[c,h]= contourf(x,y,mean(Temp,3));
xlabel('Longitude','fontsize',14');ylabel('Latitude','fontsize',14');cmocean thermal;
set(h,'showtext','on','textstep',get(h,'levelstep'));

%% Plot Time Series
Temp2 = reshape(Temp(14,:,:),nx,nt);

%%
plot(t,Temp2(67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Suhu ({\circ}C)')
grid on

%% Detrend Data Suhu
Temperature = detrend3(Temp,t);

%% Plot Data Suhu Setelah Detrend
figure
pcolor(x,y,var(Temperature,[],3))
shading interp
hold on
[c,h]= contourf(x,y,var(Temperature,[],3));
xlabel('Longitude','fontsize',14');ylabel('Latitude','fontsize',14');cmocean thermal;
set(h,'showtext','on','textstep',get(h,'levelstep'));

%% Plot Time Series Setelah Detrend
```

```
Temperature2 = reshape(Temperature(14,:,:),nx,nt);
%%
plot(t, Temperature2 (67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Trend 'Suhu ({\circ}C)')

anomaly(t,Temperature2(67,:))
grid on
```

Lampiran 3 Script Matlab Pengolahan Data Salinitas Secara Spasial dan Temporal

```
load Sal2.mat
%% Matriks Data Salinitas
nz = 1;
Salinitas = zeros(nx,ny,nt);
Salinitas = reshape(salinitas(:,:,1,:), size(Salinitas));
Salinitas = permute(Salinitas,[2 1 3]);

%% Plot Data Salinitas Rata-Rata Bulanan
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);

figure
pcolor(x,y,mean(Salinitas,3))
shading interp
hold on
[c,h]= contourf(x,y,mean(Salinitas,3));
xlabel('Longitude','fontsize',14');ylabel('Latitude','fontsize',14');cmocean halin;
set(h,'showtext','on','textstep',get(h,'levelstep'));

%%  Plot Time Series
Salinitas2 = reshape(Salinitas(14,:,:),nx,nt);

%%
plot(t,Salinitas2(67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Salinitas (psu)')
```

```
grid on
%%

%% Detrend Data Salinitas
Sal = detrend3(Salinitas,t);

%% Plot Data Salinitas Setelah Detrend
figure
pcolor(x,y,var(Sal,[],3))
shading interp
hold on
[c,h]= contourf(x,y,var(Sal,[],3));
xlabel('Longitude','fontsize',14');ylabel('Latitude','fontsize',14');cmocean halin;
set(h,'showtext','on','textstep',get(h,'levelstep'));

%% Plot Time Series Setelah Detrend
Sal = reshape(Detrend_Salinitas(14,:,:),nx,nt);
%%
plot(t,Sal(67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Trend Salinitas (psu)')

anomaly(t,Sal(67,:))
grid on
```

Lampiran 4 Script Matlab Pengolahan Data Sigma-t Secara Spasial dan Temporal

```
load Densitas2.mat
%% Matriks Data Suhu dan Salinitas
nz = 1;
Temperature = zeros(nx,ny,nt);
Temperature = reshape(temperature(:,:,1,:), size(Temperature));
Temperature = permute(Temperature,[2 1 3]);
Salinitas = zeros(nx,ny,nt);
Salinitas = reshape(salinitas(:,:,1,:), size(Salinitas));
Salinitas = permute(Salinitas,[2 1 3]);

%% Matriks Data Sigma-t
Densitas = sw_dens0(Salinitas,Temperature);
Sigmat = Densitas - 1000;
```

```
%% Plot Data Sigma-t Rata-Rata Bulanan
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);

figure
pcolor(x,y,mean(Sigmat,3))
shading interp
hold on
[c,h]= contourf(x,y,mean(Sigmat,3));
xlabel('Longitude','fontsize',14');ylabel('Latitude','fontsize',14');cmocean dense;
set(h,'showtext','on','textstep',get(h,'levelstep'));

%% Plot Time Series
Sigmat2 = reshape(Sigmat(14,:,:),nx,nt);

%%
plot(t,Sigmat2(67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Sigma-t (kg/m^3)')
grid on

%% Detrend Data Sigma-t
sigmat = detrend3(Sigmat,t);

%%  Plot Data Sigma-t Setelah Detrend
figure
pcolor(x,y,var(sigmat,[],3))
shading interp
hold on
[c,h]= contourf(x,y,var(sigmat,[],3));
xlabel('Longitude','fontsize',14');ylabel('Latitude','fontsize',14');cmocean dense;
set(h,'showtext','on','textstep',get(h,'levelstep'));

%% Plot Time Series Setelah Detrend
Sigma_t = reshape(Detrend_Sigmat(14,:,:),nx,nt);
%%
plot(t,Sigma_t(67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Trend Sigma-t (kg/m^3)')
```

```
anomaly(t,Sigma_t(67,:))
grid on
```

Lampiran 5 Script Matlab Pengolahan Data Arus Secara Spasial dan Temporal

```
load Arus2.mat
%% Matriks Data Arus
nz = 1;
U = zeros(nx,ny,nt);
U = reshape(u(:,:,1,:), size(U));
U = permute(U,[2 1 3]);
V = zeros(nx,ny,nt);
V = reshape(v(:,:,1,:), size(V));
V = permute(V,[2 1 3]);
%%
Kec = (U.^2 + V.^2).^0.5;

%% Plot Data Arus Rata-Rata Bulanan
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);

figure
pcolor(x,y,mean(Kec,3));
shading interp;
hold on
[c,h]= contour(x,y,mean(Kec,3));
hold on
Q = quiver(x,y,mean(U,3),mean(V,3),'k');
xlabel('Longitude');ylabel('Latitude');cmocean speed;colorbar;
set(h,'textstep',get(h,'levelstep'));

%% Plot Time Series
Kec2 = reshape(Kec(14,:,:),nx,nt);

%%
plot(t,Kec2(67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Kecepatan Arus (m/s)')
grid on

%% Detrend Data Arus
zonal = detrend3(U,t);
```

```
meridional = detrend3(V,t);
KecTotal = (zonal.^2 + meridional.^2).^0.5;

%% Plot Data Arus Setelah Detrend
figure
pcolor(x,y,var(KecTotal,[],3));
shading interp;
hold on
[c,h]= contour(x,y,var(KecTotal,[],3));
hold on
Q = quiver(x,y,var(zonal,[],3),var(meridional,[],3),'k');
xlabel('Longitude');ylabel('Latitude');cmocean speed;colorbar;
set(h,'textstep',get(h,'levelstep'));

%% Plot Time Series Setelah Detrend
KecTotal2 = reshape(KecTotal(14,:,:),nx,nt);
%%
plot(t,KecTotal2(67,:))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Trend Kecepatan Arus (m/s)')

anomaly(t,KecTotal2(67,:))
grid on
```

Lampiran 6 Script Matlab Analisis Data Suhu Menggunakan Metode EOF

```
% load sst.mat
%% Menghilangkan Pengaruh Musiman
Temperature = detrend3(Temperature,t);

%%Matriks Data Anomali Suhu
 [~,month,~] = datevec(t);
monthlymeans = nan(length(Lat),length(Lon),12);
for k = 1:12
    ind = month==k;
    monthlymeans(:,:,k) = mean(Temperature(:,:,ind),3);
    Temperature(:,:,ind) = bsxfun(@minus,
Temperature(:,:,ind),monthlymeans(:,:,k));
End

%% Mereduksi Dimensi Matriks Anomali Temperature dan Menghilangkan NaN
Pada Matriks Anomali Temperature
mask = ~any(isnan(Temperature),3);
```

```
Temperature = reshape(Temperature,
size(Temperature,1)*size(Temperature,2),size(Temperature,3));
temperature = Temperature;
temperature = Temperature(mask(:),:);

%% Analisis EOF
S = cov(temperature);
[V,D] = svds(S);
polaSpasial = temperature*V;
expv = 100*(diag(D.^2)./trace(D.^2))';

%% Mengembalikan Nilai NaN
k = 6;
sst = zeros(ny,nx,k);
for i = 1:k
    T(~isnan(Temperature(:,nt))) = polaSpasial(:,i);
    T(isnan(Temperature(:,nt))) = NaN;
    sst(:,:,i) = reshape(T,ny,nx);
end

%% Plot Temperature Pola Spasial
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);
sst = reshape(sst(:,:,k),ny,nx);

pcolor(x,y,sst);
shading interp;
hold on
[c,h]= contourf(x,y,sst);
xlabel('Longitude');ylabel('Latitude');cmocean thermal;colorbar;
set(h,'textstep',get(h,'levelstep'));
title(['Temperature Mode ',num2str(k),'(',num2str(expv(k),'%0.1f'),'%)'])

%% Plot Temperature Pola Temporal
plot(t,V(:,k))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Mode k')
title(['Temperature Mode ',num2str(k),'(',num2str(expv(k),'%0.1f'),'%)'])

anomaly(t,V(:,k))
grid on
%%
```

Lampiran 7 Script Matlab Analisis Data Salinitas Menggunakan Metode EOF

```
%load Sal.mat
%% Menghilangkan Pengaruh Musiman
Salinitas = detrend3(Salinitas,t);

%% Matriks Data Anomali Salinitas
[~,month,~] = datevec(t);
monthlymeans = nan(length(Lat),length(Lon),12);
for k = 1:12
   ind = month==k;
   monthlymeans(:,:,k) = mean(Salinitas(:,:,ind),3);
   Salinitas(:,:,ind) = bsxfun(@minus, Salinitas(:,:,ind),monthlymeans(:,:,k));
end

%% Mereduksi Dimensi Matriks Anomali Salinitas dan Menghilangkan NaN
Pada Matriks Anomali Salinitas
mask = ~any(isnan(Salinitas),3);
Salinitas = reshape(Salinitas, size(Salinitas,1)*size(Salinitas,2),size(Salinitas,3));
salinitas = Salinitas;
salinitas = Salinitas(mask(:),:);

%% Analisis EOF
S = cov(salinitas);
[V,D] = svds(S);
polaSpasial = salinitas*V;
expv = 100*(diag(D.^2)./trace(D.^2))';

%% Mengembalikan Nilai NaN
k = 6;
salinity = zeros(ny,nx,k);
for i = 1:k
   sal(~isnan(Salinitas(:,nt))) = polaSpasial(:,i);
   sal(isnan(Salinitas(:,nt))) = NaN;
   salinity(:,:,i) = reshape(sal,ny,nx);
end

%% Plot Salinitas Pola Spasial
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);
salinity = reshape(salinity(:,:,k),ny,nx);

pcolor(x,y,salinity);
shading interp;
hold on
```

```
[c,h]= contourf(x,y,salinity);
xlabel('Longitude');ylabel('Latitude');cmocean halin;colorbar;
set(h,'textstep',get(h,'levelstep'));
title(['Salinitas Mode ',num2str(k),'(',num2str(expv(k),'%0.1f'),'%)'])

%% Plot Salinitas Pola Temporal
plot(t,V(:,k))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Mode k')
title(['Salinitas Mode ',num2str(k),'(',num2str(expv(k),'%0.1f'),'%)'])

anomaly(t,V(:,k))
grid on
```

Lampiran 8 Script Matlab Analisis Data Sigma-t Menggunakan Metode EOF

```
%load Densitas.mat
%% Matriks Sigma-t
Densitas = sw_dens0(Salinitas,Temperature);
Sigma_t = Densitas - 1000;

%% Menghilangkan Pengaruh Musiman
Detrend_Sigma_t = detrend3(Sigma_t,t);

%% Matriks Data Anomali Sigma-t
[~,month,~] = datevec(t);
monthlymeans = nan(length(Lat),length(Long),12);
for k = 1:12
    ind = month==k;
    monthlymeans(:,:,k) = mean(Detrend_Sigma_t(:,:,ind),3);
    Anomaly_Sigma_t(:,:,ind) = bsxfun(@minus,
Detrend_Sigma_t(:,:,ind),monthlymeans(:,:,k));
end

%% Mereduksi Dimensi Matriks Anomali Sigma-t dan Menghilangkan NaN Pada
Matriks Anomali Sigma-t
mask = ~any(isnan(Anomaly_Sigma_t),3);
Anomaly_Sigma_t = reshape(Anomaly_Sigma_t,
size(Anomaly_Sigma_t,1)*size(Anomaly_Sigma_t,2),size(Anomaly_Sigma_t,3));
anomaly_sigma_t = Anomaly_Sigma_t;
anomaly_sigma_t = Anomaly_Sigma_t(mask(:),:);
```

```
%% Analisis EOF
S = cov(anomaly_sigma_t);
[V,D] = svds(S);
polaSpasial = anomaly_sigma_t*V;
expv = 100*(diag(D.^2)./trace(D.^2))';

%% Mengembalikan Nilai NaN
k = 6;
Sigma_t = zeros(ny,nx,k);
for i = 1:k
    sigma_t(~isnan(Anomaly_Sigma_t(:,nt))) = polaSpasial(:,i);
    sigma_t(isnan(Anomaly_Sigma_t(:,nt))) = NaN;
    Sigma_t(:,:,i) = reshape(sigma_t,ny,nx);
end

%% Plot Sigma-t Pola Spasial
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);
Sigma_t = reshape(Sigma_t(:,:,k),ny,nx);

pcolor(x,y,Sigma_t);
shading interp;
hold on
[c,h]= contourf(x,y,Sigma_t);
xlabel('Longitude');ylabel('Latitude');cmocean dense;
set(h,'showtext','on','textstep',get(h,'levelstep'));
title(['Hasil Analisis Anomali Sigma-t Mode
',num2str(k),'(',num2str(expv(k),'%0.1f'),'%)'])

%% Plot Sigma-t Pola Temporal
plot(t,V(:,6))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Anomali Sigma-t (kg/m^3)')
title(['Sigma-t Mode ',num2str(6),'(',num2str(expv(6),'%0.1f'),'%)'])

anomaly(t,V(:,6))
grid on
```

Lampiran 9 Script Matlab Analisis Data Arus Menggunakan Metode EOF

```
% load Arus.mat
%% Menghilangkan Pengaruh Musiman
U = detrend3(U,t);
V = detrend3(V,t);

%% Matriks Data Anomali Arus
[~,month,~] = datevec(t);
monthlymeans_U = nan(length(Lat),length(Lon),12);
monthlymeans_V = nan(length(Lat),length(Lon),12);
for k = 1:12
   ind = month==k;
   monthlymeans_U(:,:,k) = mean(U(:,:,ind),3);
   U(:,:,ind) = bsxfun(@minus, U(:,:,ind),monthlymeans_U(:,:,k));
   monthlymeans_V(:,:,k) = mean(V(:,:,ind),3);
   V(:,:,ind) = bsxfun(@minus, V(:,:,ind),monthlymeans_V(:,:,k));
end

%%
monthlymeans = (monthlymeans_U.^2 + monthlymeans_V.^2).^0.5;
monthlymeans_u =
reshape(monthlymeans_U(:,:,1),size(monthlymeans_U,1),size(monthlymeans_U,2
));
monthlymeans_v =
reshape(monthlymeans_V(:,:,1),size(monthlymeans_V,1),size(monthlymeans_V,2
));

%% Mereduksi Dimensi Matriks Anomali Arus Zonal(U) dan Arus Meridional
(V) dan Menghilangkan NaN Pada Matriks Arus Zonal(U) dan Arus Meridional
(V)
mask = ~any(isnan(U),3);
U = reshape(U, size(U,1)*size(U,2),size(U,3));
V = reshape(V, size(V,1)*size(V,2),size(V,3));
u = U;
u = U(mask(:),:);
v = V;
v = V(mask(:),:);

%%
utotal = (u.^2 + v.^2).^0.5;

%% Analisis EOF
Utotal_covarian = cov(utotal);
U_covarian = cov(u);
V_covarian = cov(v);
```

```
[Vutotal,Dutotal] = svds(Utotal_covarian);
[Vu,Du] = svds(U_covarian);
[Vv,Dv] = svds(V_covarian);
polaSpasial_U = u*Vu;
polaSpasial_V = v*Vv;
expv = 100*(diag(Dutotal.^2)./trace(Dutotal.^2))';

%% Mengembalikan Nilai NaN
k = 6;
zonal = zeros(ny,nx,k);
meridional = zeros(ny,nx,k);
for i = 1:k
    z(~isnan(U(:,nt))) = polaSpasial_U(:,i);
    z(isnan(U(:,nt))) = NaN;
    zonal(:,:,i) = reshape(z,ny,nx);
    m(~isnan(V(:,nt))) = polaSpasial_V(:,i);
    m(isnan(V(:,nt))) = NaN;
    meridional(:,:,i) = reshape(m,ny,nx);
end

%% Plot Kecepatan Arus Pola Spasial
X = linspace(133,140,nx);
Y = linspace(-11,-5,ny);
[x,y] = meshgrid(X,Y);
zonal = reshape(zonal(:,:,1),ny,nx);
meridional = reshape(meridional(:,:,1),ny,nx);
Uabs = (zonal.^2 + meridional.^2).^0.5;
%%
pcolor(x,y,Uabs);
shading interp;
hold on
[c,h]= contour(x,y,Uabs);
hold on
Q = quiver(x,y,zonal,meridional,'k');
xlabel('Longitude');ylabel('Latitude');cmocean speed;colorbar;
set(h,'textstep',get(h,'levelstep'));
title(['Kecepatan Arus Mode ',num2str(k),'(',num2str(expv(k),'%0.1f'),'%)'])

%% Plot Kecepatan Arus Pola Temporal
plot(t,Vutotal(:,k))
axis tight
xlim([datenum('jan 1,2008') datenum('dec 16,2018')])
datetick('x','keeplimits')
xlabel('Tahun');ylabel('Mode k')
title(['Kecepatan Arus Mode ',num2str(k),'(',num2str(expv(k),'%0.1f'),'%)'])
```

```
anomaly(t,Vutotal(:,k))
grid on
```